

Health Care Financing

Research Report

End Stage Renal Disease, 1987

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Health Care Financing

Research Report

The Health Care Financing Administration (HCFA) was established to combine health care financing and quality assurance programs within a single agency. HCFA is responsible for the Medicare program, Federal participation in the Medicaid program, and a variety of other health care quality assurance programs.

The mission of HCFA is to promote the timely delivery of appropriate, quality health care to its beneficiaries -- approximately 50 million of the Nation's aged, disabled, and poor. The agency must also ensure that program beneficiaries are aware of the services for which they are eligible, that those services are accessible and of high quality, and that agency policies and actions promote efficiency and quality within the total health care delivery system.

The Bureau of Data Management and Strategy (BDMS) operates HCFA's statistical data systems and maintains the national Medicare statistical files. BDMS also serves as the focal point within the agency for information systems policy, planning, and data standards development.

The Office of Research and Demonstrations (ORD) conducts studies and projects that demonstrate and evaluate optional reimbursement, coverage, eligibility, and management alternatives to the present Federal programs. In addition, ORD examines the impact of HCFA programs on health care status, utilization, and expenditures, as well as their effect on beneficiary access to services, health care providers, and the health care industry.

Health Care Financing Research Reports present the results of major studies and projects conducted by HCFA program staff. These reports contain significant findings that affect HCFA programs and are used as the basis for making program changes.

End Stage Renal Disease, 1987 reflects a wide range of data and analyses regarding the end stage renal disease program. Much of the data in this report emphasize trends and comparisons over time, making this report a standard reference source which illustrates changes in the nature of the Medicare end stage renal disease population and in the pattern of treatment of this population.

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Research Report

End Stage Renal Disease, 1987

**U.S. Department of Health and Human Services
Health Care Financing Administration
Bureau of Data Management and Strategy
Office of Research and Demonstrations
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End stage renal disease, 1987

Executive summary

With the enactment of section 299I of Public Law 92-603 (Amendments to the Social Security Act of 1972), Medicare coverage was extended to persons with end stage renal disease (ESRD), effective July 1, 1973. To be eligible for Medicare ESRD benefits, a physician must certify that an individual requires chronic dialysis or a kidney transplant to maintain life. Responsibility for implementing this legislation was shared within the then Department of Health, Education, and Welfare. The then Bureau of Health Insurance within the Social Security Administration was responsible for monitoring Medicare entitlement, utilization, and reimbursement; the Bureau of Quality Assurance within the Public Health Service was responsible for quality assurance standards, including the development of medical information registries of dialysis and transplant patients, which were incorporated into the Public Health Service's medical information system. With the organization of the Health Care Financing Administration (HCFA) in 1976, the tasks of monitoring Medicare program management and ESRD patient information were brought together.

HCFA is charged with the effective administration of Medicare benefits to qualified persons with ESRD. Integral to the effective management of the ESRD program is the operation of a comprehensive data resource covering medical and program information for the Medicare ESRD population. This data resource, known as the ESRD Program Management and Medical Information System (ESRD PMMIS), was required by Public Law 95-292, section (c)(1)(A). This system was designed to serve the needs of the Department of Health and Human Services in support of program analysis, policy development, and epidemiological research.

The ESRD PMMIS incorporates information both on Medicare ESRD patients and on Medicare-approved ESRD hospitals and dialysis facilities. The principal sources of patient-specific information are the Medicare billing records and incidence-specific medical information forms that report onset of ESRD, characteristics and status of transplant, and cause of death. The principal sources of facility information are the Medicare certification approval notices and the annual treatment survey.

The precursor of the current ESRD PMMIS was implemented in 1977. From 1977 through 1980, data forms were collected through the Medicare intermediaries and Medicare central office. These arrangements were less than successful, resulting in a 50-percent rate of noncompliance. In 1981, adjustments were made in the data collection instruments; e.g., tying the reporting of onset of ESRD to the entitlement process, and enlisting the support of the American Society of Transplant Surgeons in the development of the transplant reporting forms. As a result of these changes, reporting compliance has increased substantially; e.g., more than 91 percent of the transplant information forms were received for kidney transplants performed in 1985 and 1986.

The data that are gathered in the ESRD PMMIS and the resulting analyses of the information represent a confederation of interested components within the Department and of professional organizations representing the interest of the renal medical community. Decisions on the design of the forms, the specifications of the computer analyses, the interpretation of the results, and the preparation of publications are made collaboratively among this community.

HCFA recognizes the need to disseminate the information developed from the ESRD PMMIS data and any resulting analyses of these data as promptly as possible. The purpose of this report is to present in a single volume statistics concerning recent trends in ESRD treatment and detailed discussions of selected health issues involving the ESRD population. Several of the tables in this report emphasize trends and comparisons over time, making this report a standard reference source illustrating changes in the nature of the Medicare ESRD population and in the patterns of treatment of this population.

Data that have been released to HCFA from other organizations (i.e., the Veterans' Administration, Centers for Disease Control, European Dialysis and Transplantation Association, Australia and New Zealand Dialysis and Transplant Registry, and Canadian Renal Failure Register) have been included whenever appropriate.

NOTES: A glossary of terms associated with ESRD and the Medicare ESRD program is provided in Appendix A. A complete explanation of entitlement provisions is found in Appendix B.

Incidence and enrollment

Program incidence

Trends in Medicare ESRD program incidence for the years 1981-86 are described in this section. The new Medicare ESRD enrollee population by age, sex, race, primary diagnosis, and State are presented in the accompanying tables.

The total counts of new Medicare ESRD beneficiaries by age, sex, and race, and primary diagnosis are shown in Table 1. In 1981, 19,325 persons were added to the Medicare enrollment files as ESRD beneficiaries. By 1986, the annual number of new ESRD beneficiaries had increased to 30,717 or an average annual increase of 9.7 percent. By age group, the largest rates of growth were among persons 65-74 years of age (13.2 percent), and persons 75 years of age or over (22.9 percent).

The annual rate of increase was greater for females (9.9 percent) than for males (9.5 percent) and was greater for black persons (10.9 percent) than for white persons (9.7 percent). Rates of growth were also high for Asian persons (30.0 percent) and for American Indians (20.0 percent). However, all of these

increases are likely because of improved reporting on the HCFA-2728, Chronic Renal Disease Medical Evidence Report.

Annual rates of growth exceeded 12 percent for persons whose renal failure was attributed to diabetes, glomerulonephritis, or hypertension. However, much of this increase was because of better reporting on the HCFA-2728 as shown by a 6.4 percent annual decrease in the unknown category.

In 1986, the rate of increase of new enrollees was 5.5 percent. The increase was largest for persons 75 years of age or over (13.7 percent), while there was a decrease of 1.9 percent in cases for persons in the 15-24 years of age group.

Of the 30,717 new Medicare ESRD beneficiaries in 1986, 36.7 percent were 65 years of age or over; 55.1 percent were male; 68.5 percent were white; and 29.2 percent had diabetes reported as the primary cause of renal failure.

Medicare ESRD program incidence expressed in terms of rates per million population is shown in Table 2. From 1981-86, program incidence increased from 84 enrollees per million persons to 127 enrollees per million persons, an annual increase of 8.6 percent.

Table 1

Medicare end stage renal disease program incidence, by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent change	Percent change 1985-86
Number of new enrollees								
Total	19,325	21,869	25,016	26,380	29,111	30,717	9.7	5.5
Age								
Under 15 years	338	414	382	436	414	425	4.7	2.7
15-24 years	1,115	1,172	1,096	1,153	1,189	1,166	0.9	-1.9
25-34 years	2,188	2,464	2,458	2,619	2,695	2,936	6.1	8.9
35-44 years	2,366	2,600	2,827	3,009	3,366	3,592	8.7	6.7
45-54 years	3,239	3,531	3,735	3,853	4,209	4,349	6.1	3.3
55-64 years	4,721	5,280	5,754	6,259	6,859	6,964	8.1	1.5
65-74 years	3,945	4,594	5,997	6,096	6,899	7,329	13.2	6.2
75 years or over	1,413	1,814	2,767	2,955	3,480	3,956	22.9	13.7
Sex								
Male	10,731	12,103	13,764	14,609	15,884	16,913	9.5	6.5
Female	8,594	9,766	11,252	11,771	13,227	13,804	9.9	4.4
Race								
Asian	130	308	310	379	496	482	30.0	-2.8
Black	5,009	5,955	7,123	7,431	8,153	8,393	10.9	2.9
White	13,237	15,193	17,028	18,087	19,918	21,028	9.7	5.6
American Indian	128	194	257	261	268	318	20.0	18.7
Other/unknown	821	219	298	222	276	496	-9.6	79.7
Diagnosis								
Diabetes	3,623	5,006	5,879	7,075	8,126	8,981	19.9	10.5
Glomerulonephritis	3,445	5,100	5,482	5,793	6,162	6,102	12.1	-1.0
Hypertension	3,931	5,376	5,727	6,388	7,197	7,446	13.6	3.5
Polycystic kidney disease	833	1,014	1,056	1,061	1,147	1,173	7.1	2.3
Other	2,024	2,215	2,597	2,769	3,166	3,082	8.8	11.3
Unknown	5,469	3,158	4,275	3,294	3,313	3,933	-6.4	19.4

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86.

Table 2
Medicare end stage renal disease program incidence rates per million population,
by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent change	Percent change 1985-86
Number of enrollees per million population								
Total	84	94	107	112	122	127	8.6	4.5
Age								
Under 15 years	7	8	7	8	8	8	4.4	2.5
15-24 years	26	28	27	29	30	30	2.5	-0.6
25-34 years	56	62	61	64	64	69	4.1	7.0
35-44 years	90	93	96	99	106	109	3.9	2.5
45-54 years	143	157	166	171	186	191	5.9	2.3
55-64 years	215	239	259	280	307	313	7.8	2.0
65-74 years	248	284	364	364	406	423	11.3	4.3
75 years or over	137	171	253	263	302	334	19.5	10.8
Sex								
Male	96	107	121	127	137	144	8.4	5.4
Female	73	82	93	97	108	112	8.9	3.4
Race								
Asian	36	83	83	101	130	126	28.7	-3.8
Black	181	213	252	261	283	289	9.8	1.9
White	67	76	85	89	97	102	8.6	4.5
American Indian	86	129	170	171	174	204	18.8	17.5
Other/unknown	-	-	-	-	-	-	-	-
Diagnosis								
Diabetes	16	22	25	30	34	37	18.7	9.5
Glomerulonephritis	15	22	23	24	26	25	11.0	-1.9
Hypertension	17	23	24	27	30	31	12.5	2.5
Polycystic kidney disease	4	4	5	4	5	5	6.0	1.3
Other	9	10	11	12	13	13	7.7	-3.6
Unknown	24	14	18	14	14	16	-7.3	17.6

NOTE: Average annual percent change calculated by use of compounding.

SOURCES: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86; and U.S. Department of Commerce, Bureau of the Census: Population Estimates and Projections. *Current Population Reports*. Series P-25, No. 998. Washington: U.S. Government Printing Office.

Incidence rates are strongly related to age, ranging from 8 enrollees per million persons in the under 15 years of age group to 423 enrollees per million persons in the 65-74 years of age group. Males have a higher incidence rate (144 enrollees per million) than do females (112 enrollees per million). Black persons have the highest incidence rate (289 enrollees per million), followed by American Indians (204 enrollees per million), Asian persons (126 enrollees per million), and white persons (102 enrollees per million).

Medicare ESRD program incidence is shown by State in Table 3. Overall, as shown in Table 2, incidence rates are increasing. This is generally the case for individual States as well. Of the 50 States and the District of Columbia, all States except Wyoming had higher program incidence rates in 1986 than in 1981. In 1981, six States had incidence rates greater than 100 enrollees per million persons. In contrast, 35 States had high incidence rates in 1986.

Variations in Medicare ESRD program incidence are illustrated in depth in Table 4. State incidence rates

were averaged across the 6 years 1981-86 to make the estimates more stable. States were ranked from highest to lowest incidence rates. During this interval, the U.S. total incidence rates averaged 108 enrollees per million. The rates ranged from a high of 254 enrollees per million in the District of Columbia to a low of 37 enrollees per million in Alaska. The rates were then age-sex-race adjusted (with the indirect method) to control for demographic differences across States. In general, the age-sex-race adjustment did not greatly alter the ranking of the States. However, it did narrow the range of incidence rates considerably. The District of Columbia, where black persons comprise 70 percent of the total population, had an adjusted incidence rate (121 per million) or 52 percent lower than its unadjusted incidence rate. Its unadjusted incidence rate is 88 percent higher than any other State's unadjusted incidence rate. (Florida is second at 135 per million.) However, after adjusting for the age, sex, and race distribution, two States, New Jersey (127 per million) and Connecticut (121 per million), have equal

Table 3

Medicare end stage renal disease program incidence rates per million population, by State: 1981-86

State	1981	1982	1983	1984	1985	1986
Number of enrollees per million population						
United States	84	94	107	112	122	127
Alabama	89	103	133	125	132	135
Alaska	34	27	35	32	23	70
Arizona	93	97	121	111	125	136
Arkansas	69	75	102	110	109	113
California	87	98	113	113	123	134
Colorado	63	57	58	67	75	96
Connecticut	80	93	120	110	145	131
Delaware	97	117	84	104	143	139
District of Columbia	191	270	270	261	316	216
Florida	111	116	132	139	147	161
Georgia	108	108	131	128	131	145
Hawaii	102	103	107	116	172	149
Idaho	47	60	63	65	83	84
Illinois	84	97	107	112	128	136
Indiana	74	82	97	95	106	104
Iowa	65	69	82	76	92	104
Kansas	62	84	75	86	94	97
Kentucky	69	71	75	87	102	105
Louisiana	95	94	106	122	131	153
Maine	63	54	65	92	83	84
Maryland	90	103	106	124	128	120
Massachusetts	67	86	94	100	96	101
Michigan	77	88	100	114	116	124
Minnesota	67	70	76	87	94	97
Mississippi	75	93	124	122	129	131
Missouri	80	88	91	106	115	124
Montana	74	51	72	84	76	78
Nebraska	75	64	68	72	92	92
Nevada	71	87	113	97	118	143
New Hampshire	70	68	69	77	79	82
New Jersey	101	120	141	127	151	160
New Mexico	70	91	98	99	106	103
New York	86	99	110	116	120	129
North Carolina	81	95	109	113	139	136
North Dakota	62	63	63	76	77	97
Ohio	72	89	98	105	115	123
Oklahoma	72	75	75	88	93	103
Oregon	53	64	83	79	94	104
Pennsylvania	83	96	108	125	136	141
Rhode Island	86	80	105	119	127	103
South Carolina	103	111	125	135	162	159
South Dakota	85	78	80	89	97	90
Tennessee	75	87	108	95	110	112
Texas	86	96	106	104	117	121
Utah	67	51	62	91	69	79
Vermont	54	69	69	70	79	65
Virginia	92	107	130	132	148	122
Washington	63	59	74	80	86	87
West Virginia	66	78	93	111	104	115
Wisconsin	60	81	75	89	89	97
Wyoming	49	55	45	55	65	39

SOURCES: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86; and U.S. Department of Commerce, Bureau of the Census: Population Estimates and Projections. *Current Population Reports*. Series P-25, No. 998. Washington. U.S. Government Printing Office.

Table 4
Average Medicare end stage renal disease program incidence rates
per million population, by State: 1981-86

State	Unadjusted		Age, sex, race, adjusted	
	Rate	Rank	Rate	Rank
Number of enrollees per million population				
Alabama	119	8	102	22
Alaska	37	51	46	51
Arizona	115	11	118	4
Arkansas	96	27	89	42
California	112	17	101	27
Colorado	70	47	84	48
Connecticut	113	13	121	2
Delaware	114	12	114	11
District of Columbia	254	1	121	3
Florida	135	2	116	6
Georgia	126	5	114	12
Hawaii	125	6	67	50
Idaho	67	49	88	45
Illinois	111	18	108	15
Indiana	93	30	106	17
Iowa	81	38	98	30
Kansas	83	35	92	37
Kentucky	85	33	97	32
Louisiana	117	9	102	23
Maine	73	43	91	38
Maryland	112	16	102	25
Massachusetts	91	31	102	24
Michigan	103	23	108	14
Minnesota	82	36	102	20
Mississippi	112	14	89	43
Missouri	101	24	102	21
Montana	73	45	89	41
Nebraska	77	40	90	39
Nevada	105	20	118	5
New Hampshire	74	42	95	34
New Jersey	133	3	127	1
New Mexico	95	28	95	35
New York	110	19	99	29
North Carolina	112	15	101	26
North Dakota	73	44	90	40
Ohio	100	25	107	16
Oklahoma	85	34	86	47
Oregon	79	39	94	36
Pennsylvania	115	10	115	8
Rhode Island	103	22	115	10
South Carolina	133	4	115	9
South Dakota	87	32	99	28
Tennessee	98	26	96	33
Texas	105	21	106	18
Utah	70	46	105	19
Vermont	68	48	88	44
Virginia	122	7	115	7
Washington	75	41	87	46
West Virginia	94	29	109	13
Wisconsin	82	37	98	31
Wyoming	51	50	71	49

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86.

or higher incidence rates. Similarly, Utah, in which the black population is less than 1 percent of the total, had an adjusted rate (105 per million) 50 percent greater than the unadjusted rate. Of the 27 States and the District of Columbia with unadjusted rates higher than the U.S. total rate, 17 States had lower adjusted rates. All of the 22 States with unadjusted rates below the U.S. total rate had higher adjusted rates.

Incidence rates for the years 1981-86 for a number of countries that have end stage renal disease registries, and for the United States are presented in Table 5. In 1986, most of these countries had incidence rates between 30 and 70 per million population. These rates

probably represent not only a difference in underlying renal failure, but medical and economic constraints among the various countries as well. During the period 1981-86, there was an increase in incidence in all but one of the countries shown in Table 5. Thus, it would appear that the trend toward expansion of renal treatment in the United States is paralleled to other Western countries. Nevertheless, in 1986, treated renal failure among white persons in the United States was more than 50 percent higher than all but three of the displayed countries.

Table 5
New end stage renal disease patients per million population, for selected countries: 1981-86

Country	1981	1982	1983	1984	1985	1986	Average annual percent increase	Percent change 1985-86
Number of patients per million								
Austria	41	41	54	62	57	70	11.3	22.8
Belgium	48	48	61	70	62	74	9.0	19.4
Bulgaria	14	23	28	20	33	33	18.7	0.0
Czechoslovakia	17	20	21	21	23	27	9.7	17.4
Denmark	37	32	40	40	43	56	8.6	30.2
Federal Republic of Germany	51	52	56	67	59	66	5.3	11.9
Finland	37	34	46	35	45	41	2.1	-8.9
France	44	41	44	49	43	44	0.0	2.3
German Democratic Republic	22	26	28	33	32	35	9.7	9.4
Greece	32	29	41	47	58	54	11.0	-6.9
Hungary	6	12	12	14	19	16	21.7	-15.8
Iceland	25	35	5	50	0	37	8.2	-
Ireland	25	21	24	28	48	33	5.7	-31.3
Israel	52	62	67	75	59	58	2.2	-1.7
Italy	43	43	46	48	47	49	2.6	4.3
Luxembourg	33	45	73	38	52	85	20.8	63.5
Netherlands	35	32	46	34	49	48	6.5	-2.0
Norway	49	39	54	53	36	59	3.8	63.9
Poland	6	7	8	11	10	13	16.7	30.0
Portugal	18	28	41	43	49	50	22.7	2.0
Spain	40	42	61	59	45	51	5.0	13.3
Sweden	47	53	61	60	62	60	5.0	-3.2
Switzerland	45	49	55	47	59	65	7.6	10.2
United Kingdom	28	31	33	34	43	47	10.9	9.3
Yugoslavia	23	21	32	36	32	36	9.4	12.5
Australia	38	37	38	45	39	44	3.0	12.8
New Zealand	35	33	30	34	37	38	1.7	2.7
Canada	49	51	53	58	61	67	6.5	9.8
United States ¹	84	94	107	111	121	127	8.6	5.0
White	67	76	85	89	97	102	8.8	5.2
Black	181	212	252	260	281	289	9.8	2.8
Asian	34	83	83	101	129	126	30.0	-2.3
Indian	86	76	170	170	171	204	18.9	19.3

¹ Includes only Medicare entitled end stage renal disease (ESRD) patients. Of all ESRD patients in the United States, it is estimated that 7 to 10 percent are not Medicare eligible.

SOURCES: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86; European Dialysis and Transplant Association (EDTA) Combined Report on Regular Dialysis and Transplantation in Europe, 1981-86; Canadian Renal Failure Register, 1986; Tenth Report on the Australia and New Zealand Dialysis and Transplant Registry, July 1987.

Table 6
Medicare end stage renal disease enrollment, by dialysis and functioning graft: 1978-86

Year	Patients on dialysis		Patients with a functioning graft		All patients	
	Number	Percent	Number	Percent	Number	Percent
1978	42,403	89.1	5,172	10.9	47,575	100.0
1979	49,643	88.5	6,457	11.5	56,100	100.0
1980	56,485	88.0	7,692	12.0	64,177	100.0
1981	62,855	87.6	8,890	12.4	71,745	100.0
1982	69,861	86.7	10,768	13.3	80,629	100.0
1983	77,516	85.6	13,068	14.4	90,584	100.0
1984	83,545	83.9	16,075	16.1	99,620	100.0
1985	89,135	82.1	19,477	17.9	108,612	100.0
1986	93,537	79.9	23,581	20.1	117,118	100.0
Average annual percent increase	10.4	--	20.9	--	11.9	--
1985-86 percent increase	4.9	--	21.1	--	7.8	--

NOTES: Enrollment is as of December 31 of each year and includes Medicare patients who are alive and currently entitled. Average annual percent increase calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1978-86.

Table 7
Medicare end stage renal disease program enrollment for dialysis patients, by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent increase	Percent change 1985-86
	Number of patients							
Total	62,855	69,861	77,516	83,545	89,135	93,537	8.3	4.9
Age								
Under 15 years	719	807	830	825	769	759	1.1	-1.3
15-24 years	3,309	3,414	3,322	3,259	3,178	2,972	-2.1	-6.5
25-34 years	7,215	7,777	8,061	8,272	8,453	8,526	3.4	0.9
35-44 years	8,596	9,399	10,402	11,070	11,735	12,344	7.5	5.2
45-54 years	11,772	12,662	13,377	14,140	14,740	15,101	5.1	2.4
55-64 years	15,909	17,759	19,460	20,956	22,264	22,916	7.6	2.9
65-74 years	11,684	13,535	16,059	17,907	19,666	21,443	12.9	9.0
75 years or over	3,651	4,508	6,005	7,116	8,330	9,476	21.0	13.8
Sex								
Male	34,282	37,859	41,767	44,868	47,410	49,337	7.6	4.1
Female	28,573	32,002	35,749	38,677	41,725	44,200	9.1	5.9
Race								
Asian	267	489	664	835	1,068	1,193	34.9	11.7
Black	18,594	21,185	24,174	26,714	29,102	31,023	10.8	6.6
White	40,781	45,137	49,538	52,893	55,851	57,969	7.3	3.8
American Indian	190	332	511	640	726	832	34.4	14.6
Other/unknown	3,023	2,718	2,629	2,463	2,388	2,520	-16.6	5.5
Diagnosis								
Diabetes	6,192	8,610	10,918	13,580	16,011	18,190	24.1	13.6
Glomerulonephritis	10,539	13,270	15,669	17,625	19,363	20,323	14.0	5.0
Hypertension	9,244	12,128	14,670	16,983	19,190	21,063	17.9	9.8
Polycystic kidney disease	3,113	3,653	4,082	4,374	4,649	4,749	8.8	2.2
Other	5,534	6,387	7,228	7,947	8,693	9,043	10.3	4.0
Unknown	28,233	25,813	24,949	23,036	21,229	20,169	-6.5	-5.0

NOTES: All calculations are based on unrounded numbers. Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86.

Program enrollment

Trends in Medicare ESRD program enrollment for the years 1981-86 are described in this section. Tables are presented that show Medicare ESRD enrollment by age, sex, race, and primary diagnosis. Enrollment is broken into two distinct groups of persons: those on dialysis and those with a functioning graft. Enrollment counts are taken as of December 31 of each year and reflect the patients' dialysis or transplant status as of that date.¹

Medicare enrollment by dialysis and functioning graft patient groups for the years 1978-86 is presented in Table 6. During this time, enrollment grew from 47,575 to 117,118 -- an average annual rate of increase of 11.9 percent. The number of persons on dialysis grew at a slower rate of 10.4 percent per year (from 42,403 in 1978 to 93,537 in 1986). From 1985 to 1986, the rate of growth was only 4.9 percent. The number of patients with a functioning kidney graft increased at an annual rate of more than 20 percent (from 5,172 in 1978 to 23,581 in 1986). The reasons for the rapid growth in patients with a functioning graft are increases in the number of transplants performed and increased graft survival rates. As a result of these transplantation trends, patients with a functioning graft increased from 10.9 percent of the total Medicare ESRD population in 1978 to 20.1 percent in 1986.

Medicare dialysis patient population by age, sex, race, and primary diagnosis for the years 1981-86 is shown in Table 7. Growth in the dialysis patient population has been greatest for persons 65 years of age or over, primarily as a result of the increased program incidence rates shown in Tables 1 and 2. In 1981, persons 65 years of age or over accounted for 24.4 percent of the total dialysis patient population, increasing to 33.1 percent in 1986. The impact of transplantation is evident in dialysis patient trends for the younger age groups. For the group under 15 years of age, dialysis population growth peaked in 1983 and declined in all subsequent years. For persons 15-24 years of age, the dialysis population peaked in 1982 and has been followed by 4 consecutive years of decreases.

In 1986, 52.7 percent of the Medicare dialysis population were male; 62.0 percent were white persons; and 19.4 percent were persons for whom diabetes was reported as the primary cause of renal failure.

The Medicare dialysis patient population expressed as enrollment per million population is shown in Table 8. Overall, dialysis patient enrollment increased from 274 per million population in 1981 to 388 per million in 1986 -- an average annual increase of 7.2 percent. Dialysis enrollment rates vary markedly with age, ranging from 15 per million for persons under 15 years of age to 1,237 per million for persons 65-74 years of age. Males have an enrollment rate 17.6 percent greater than females (420 per million and 357 per million, respectively). Dialysis patient enrollment for black persons is 3.8 times as great as for white persons (1,067 per million and 281 per million, respectively). Enrollment rates among Asian persons and American Indians are probably underestimated because of underreporting in earlier years.

The Medicare ESRD population with a functioning graft is presented in Table 9 by age, sex, race, and primary diagnosis for the years 1981-86. The same population in terms of rates per million population is shown in Table 10. In contrast to the dialysis population, those persons with a functioning graft come largely from the younger age groups. Of persons with a functioning graft in 1981 and 1986, 90.6 percent and 86.7 percent, respectively, were under 55 years of age.

In 1986, 63.0 percent of the Medicare ESRD population with a functioning kidney graft were male; 78.2 percent were white persons; and 16.3 percent were persons for whom diabetes was reported as the primary cause of renal failure.

In terms of rates per million population, the ESRD functioning graft population has increased from 39 per million in 1981 to 98 per million in 1986, a 20.4 percent annual increase. In 1986, those persons 35-44 years of age and 45-54 years of age had the highest rate per million population (199 per million and 203 per million, respectively). The rate was higher for males (127 per million) than for females (70 per million) and was higher for black persons (148 per million) than for white persons (89 per million).

¹ Before 1984, there were problems of underreporting of kidney transplants. Consequently, some people who have a functioning graft will be misclassified as on dialysis. Therefore, the data will tend to overestimate the number of persons on dialysis and underestimate the number of people with functioning grafts.

Table 8
Medicare end stage renal disease program dialysis enrollment per million population,
by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent change	Percent change 1985-86
Number of enrollees per million								
Total	274	301	331	353	373	388	7.2	3.9
Age								
Under 15 years	14	16	16	16	15	15	0.8	-1.5
15-24 years	79	82	81	81	80	76	-0.6	-5.2
25-34 years	185	197	199	201	201	199	1.5	-0.9
35-44 years	326	335	355	362	369	373	2.8	1.0
45-54 years	521	563	596	629	653	662	4.9	1.4
55-64 years	725	803	875	939	997	1,031	7.3	3.4
65-74 years	734	836	974	1,070	1,156	1,237	11.0	7.0
75 years or over	354	424	549	634	722	801	17.8	10.8
Sex								
Male	307	336	367	390	408	420	6.5	3.0
Female	242	268	297	318	340	357	8.1	4.9
Race								
Asian	73	132	178	222	281	311	33.6	10.6
Black	672	758	856	937	1,011	1,067	9.7	5.6
White	207	227	247	261	273	281	6.2	2.8
American Indian	128	221	338	419	471	534	33.1	13.5
Other/unknown	-	-	-	-	-	-	-	-
Diagnosis								
Diabetes	27	37	47	57	67	75	22.9	12.5
Glomerulonephritis	46	57	67	75	81	84	12.9	3.9
Hypertension	40	52	63	72	80	87	16.8	8.7
Polycystic kidney disease	14	16	17	18	19	20	7.8	1.2
Other	24	28	31	34	36	38	9.3	3.0
Unknown	123	111	106	97	89	84	-7.4	-5.9

NOTES: All calculations are based on unrounded numbers. Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86.

Table 9
Medicare end stage renal disease program enrollment for patients with functioning grafts,
by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent change	Percent increase 1985-86
Number of patients								
Total	8,890	10,768	13,068	16,075	19,477	23,581	21.5	21.1
Age								
Under 15 years	270	335	419	534	650	734	22.1	12.9
15-24 years	1,277	1,457	1,690	1,889	2,132	2,370	13.2	11.2
25-34 years	2,665	3,147	3,772	4,540	5,233	6,115	18.1	16.9
35-44 years	2,194	2,772	3,407	4,314	5,389	6,596	24.6	22.4
45-54 years	1,651	1,993	2,429	3,003	3,745	4,636	22.9	23.8
55-64 years	748	950	1,200	1,592	2,027	2,675	29.0	32.0
65-74 years	82	111	148	198	292	440	39.9	50.7
75 years or over	3	3	3	5	9	15	38.0	66.7
Sex								
Male	5,478	6,720	8,180	10,093	12,269	14,864	22.1	21.2
Female	3,412	4,048	4,888	5,982	7,208	8,717	20.6	20.9
Race								
Asian	22	61	127	202	261	371	76.0	42.1
Black	1,368	1,755	2,240	2,843	3,548	4,289	25.7	20.9
White	6,976	8,447	10,225	12,608	15,228	18,448	21.5	21.1
American Indian	107	120	139	141	171	199	13.2	16.4
Other/unknown	417	385	337	281	269	274	-8.1	1.9
Diagnosis								
Diabetes	725	1,086	1,527	2,109	2,901	3,848	39.6	32.6
Glomerulonephritis	2,229	2,874	3,733	4,898	6,073	7,383	27.1	21.6
Hypertension	579	837	1,155	1,528	1,980	2,510	34.1	26.8
Polycystic kidney disease	307	439	603	847	1,061	1,384	35.2	30.4
Other	757	955	1,284	1,718	2,218	2,740	29.3	23.5
Unknown	4,293	4,577	4,766	4,975	5,244	5,716	5.9	9.0

NOTES: All calculations are based on unrounded numbers. Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988, 1981-86.

Table 10
Medicare end stage renal disease program enrollment per million population for patients with functioning grafts, by age, sex, race, and primary diagnosis: 1981-86

Age, sex, race, and primary diagnosis	1981	1982	1983	1984	1985	1986	Average annual percent increase	Percent increase 1985-86
Number of patients per million								
Total	39	46	56	68	82	98	20.4	19.9
Age								
Under 15 years	5	7	8	10	13	14	21.8	12.7
15-24 years	30	35	41	47	54	61	14.9	12.7
25-34 years	68	80	93	110	125	143	15.9	14.8
35-44 years	83	99	116	141	170	199	19.1	17.6
45-54 years	73	89	108	133	166	203	22.7	22.6
55-64 years	34	43	54	71	91	120	28.7	32.6
65-74 years	5	7	9	12	17	25	37.6	47.9
75 years or over	0	0	0	0	1	1	34.2	62.4
Sex								
Male	49	60	72	89	106	127	20.9	19.9
Female	29	34	41	49	59	70	19.5	19.8
Race								
Asian	6	17	34	54	69	97	74.2	40.8
Black	49	63	79	100	123	148	24.5	19.7
White	35	42	51	62	74	89	20.3	20.0
American Indian	72	80	92	92	111	128	12.1	15.2
Other/unknown	-	-	-	-	-	-	-	-
Diagnosis								
Diabetes	3	5	7	9	12	16	38.3	31.4
Glomerulonephritis	10	12	16	21	25	31	25.8	20.4
Hypertension	3	4	5	6	8	10	32.8	25.5
Polycystic kidney disease	1	2	3	4	4	6	33.8	29.2
Other	3	4	5	7	9	11	28.1	22.3
Unknown	19	20	20	21	22	24	4.9	7.9

NOTES: All calculations are based on unrounded numbers. Average annual percent increase calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1981-86.

Patient treatment trends

Dialysis patients

The statistics in this section are taken from the End Stage Renal Disease Facility Survey, Form HCFA-2744. The facility survey covers all patients receiving services at Medicare-approved dialysis facilities and transplant centers. All figures shown are as of December 31 of the year given. The facility survey includes both Medicare and non-Medicare entitled patients; thus, the data are not strictly comparable to the Medicare ESRD population described in the previous section.

The ESRD dialysis population by type and place of dialysis for the years 1982-87 are shown in Table 11. During these years, the total U.S. dialysis population increased from 65,765 to 98,432, or an average annual growth rate of 8.4 percent. However, the rate of growth declined from 9.5 in 1983 to 7.2 percent in 1986. However, in 1987, the rate of growth increased to 8.3 percent. By far the most common dialysis modality is in-unit hemodialysis. Patients receiving dialysis in this modality increased from 52,559 in 1982 to 79,352 in 1987. In 1987, in-unit hemodialysis accounted for 80.6 percent, slightly more than the 79.9 percent for this modality in 1982. A small number of patients receive in-unit peritoneal dialysis. However, the number of these patients has declined and, by 1987, accounted for only 0.4 percent of all dialysis patients.

The remaining dialysis patients either dialyze at home or are involved in a self-dialysis training program. The two fastest growing forms of dialysis are continuous ambulatory peritoneal dialysis (CAPD) and continuous cycling peritoneal dialysis (CCPD). CAPD grew rapidly through 1985. However, growth was much slower in both 1986 and 1987 (6.0 percent and 7.7 percent, respectively). CCPD was broken out as a separate category in the 1984 facility survey. The number of patients on CCPD increased by 10.9 percent in 1985, by 37.1 percent in 1986, and by 30.7 percent in 1987. In 1987, CAPD and CCPD patients accounted for 13.0 and 1.7 percent of all patients on dialysis, respectively.

Since 1982, the home hemodialysis population has declined every year, from 4,394 in 1982 to 3,582 in 1987. In 1987, home hemodialysis patients comprised 3.6 percent of the total dialysis population and 19.6 percent of the total home dialysis population. Patients on any form of home dialysis or training have declined as a percent of the total dialysis population in recent years, from a high of 20.0 percent in 1984 to 18.9 percent in 1987.

The number of patients participating in some form of self-care dialysis is shown in Table 12. The number of patients in self-care dialysis has increased from 12,804 in 1982 to 19,790 in 1987, an annual increase of

9.1 percent. However, in 1987, the increase was only 5.9 percent. In 1987, CAPD and CCPD patients accounted for 64.8 percent and 8.6 percent of all self-care dialysis patients, respectively.

The number of persons completing self-dialysis training is also shown in Table 12. Although the number of persons completing self-dialysis training increased by 8.0 percent per year during the entire time span, the increase from 1986 to 1987 was only 7.2 percent. In-unit self-care, home hemodialysis, and home peritoneal have declined in recent years, both in terms of training and numbers of persons using these modalities.

Transplant patients

The trend in numbers of kidney transplant patients since the ESRD program's inception is shown in Table 13. The numbers increased from 1974-87 by an annual rate of 8.3 percent. In recent years, increases have averaged over 10 percent per year. Between 1978 and 1986, the number of transplant patients increased from 3,949 to 8,948, an annual rate of increase of 10.8 percent. The 16.6 percent increase in 1986 was the second largest percentage increase since 1974. However, in 1987, the number of transplant patients remained unchanged from 1986.

Most kidney transplant patients are covered by Medicare. In 1981, there were 4,421 Medicare-covered transplant patients. This increased in the following 6 years to 8,298. In 1987, Medicare covered 92.7 percent of all kidney transplants, up slightly from 90.5 percent in 1981.

Kidney transplants by donor type for the years 1980-87 are shown in Table 14. In 1980, cadaver donor transplants accounted for 3,422 or 72.9 percent of the 4,697 total kidney transplants in the United States. The number of cadaver donor transplants increased by an annual rate of 10.9 percent, as compared with the 5.9 percent annual increase among living-related donor transplants. Consequently, by 1987, nearly four-fifths (78.7 percent) of all transplants were cadaver donor. However, from 1986 to 1987, there was a slight increase in living-related donor transplants (1.1 percent), compared with a decrease of 0.4 percent in cadaver donor transplants.

From 1980-87, the number of persons awaiting transplant increased from 5,072 to 12,140, an average annual increase of 13.3 percent (Table 15). In 1980, 9.7 percent of all dialysis patients were awaiting a transplant. By 1987, this had increased to 12.3 percent, perhaps indicating a broader range of dialysis patients are being added to the waiting lists. However, from 1986 to 1987, there was almost no change in the percent of total patients awaiting a transplant.

Table 11

End stage renal disease dialysis population, by type and place of dialysis: 1982-87 ¹

Type and place of dialysis	1982	1983	1984	1985	1986	1987	Average annual percent change	Percent change 1986-87
Number of patients								
Total	65,765	71,987	78,483	84,797	90,886	98,432	8.4	8.3
In-unit hemodialysis	52,559	57,029	62,174	67,241	72,756	79,352	8.6	9.1
In-unit peritoneal	885	745	590	584	510	440	-13.0	-15.1
Home hemodialysis	4,394	4,323	4,125	3,983	3,675	3,582	-4.0	-2.5
Home peritoneal ²	816	790	259	231	191	168	-27.1	-12.0
CAPD ³	6,523	8,532	9,995	11,236	11,913	12,825	14.7	7.7
CCPD ⁴	--	--	859	953	1,307	1,708	25.7	30.7
Self training	588	568	481	569	534	357	-9.5	-33.1

¹ Counts are as of December 31 of each year from the End Stage Renal Disease Facility Surveys.

² This figure decreased significantly in 1984, partially because the CCPD patients were counted in this category in previous years. A CCPD category was added to the ESRD Facility Survey in 1984.

³ Continuous ambulatory peritoneal dialysis.

⁴ Continuous cycling peritoneal dialysis.

NOTE: Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1982-87.

Table 12
Self-care dialysis population, by type and place of dialysis: 1982-87

Type and place of dialysis	1982	1983	1984	1985	1986	1987	Average annual percent change	Percent change 1986-87
Number of patients								
Total self-care population ¹	12,804	15,123	16,855	18,130	18,682	19,790	9.1	5.9
Completed training	6,748	7,345	8,112	9,190	9,258	9,928	8.0	7.2
In-unit self-care								
hemodialysis population	1,060	1,475	1,611	1,726	1,595	1,507	7.3	-5.5
Completed training	465	560	525	640	543	447	-0.8	-17.7
Home hemodialysis population	4,394	4,323	4,125	3,983	3,675	3,582	-4.0	-2.5
Completed training	1,100	1,140	1,086	1,047	874	823	-5.6	-5.8
Home peritoneal population ²	816	790	259	231	191	168	-27.1	-12.0
Completed Training	669	581	247	165	141	212	-20.5	50.4
CAPD ³ population	6,523	8,532	9,995	11,236	11,913	12,825	14.5	7.7
Completed training	4,505	5,061	5,691	6,584	6,723	7,184	9.8	6.9
CCPD ⁴ population	--	--	859	953	1,307	1,708	25.7	30.7
Completed training	--	--	562	752	968	1,258	30.8	30.0

¹ Total self-care training includes a small number of in-unit peritoneal patients.

² This figure decreased significantly in 1984, partially because CCPD patients were counted in this category in previous years. A CCPD category was added to the End Stage Renal Disease Facility Survey in 1984.

³ Continuous ambulatory peritoneal dialysis.

⁴ Continuous cycling peritoneal dialysis.

NOTE: Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1982-87.

Table 13
Kidney transplant patients, by Medicare coverage: 1973-87

Year	Total		Medicare coverage ¹			
	Number	Percent change	Medicare Number	Percent change	Non-Medicare Number	Percent change
1973 ²	1,600	—	—	—	—	—
1974	3,190	—	—	—	—	—
1975	3,730	16.9	—	—	—	—
1976	3,504	-6.1	—	—	—	—
1977	3,973	13.4	—	—	—	—
1978	3,949	-0.6	—	—	—	—
1979	4,271	8.2	—	—	—	—
1980	4,697	10.0	—	—	—	—
1981	4,885	4.0	4,421	—	464	—
1982	5,358	9.7	4,917	11.2	441	-5.0
1983	6,112	14.1	5,616	14.2	496	12.5
1984	6,968	14.0	6,029	7.4	939	89.3
1985	7,676	10.2	7,073	17.3	603	-35.8
1986	8,948	16.6	8,258	16.8	690	8.3
1987	8,949	-0.0	8,298	0.5	651	-5.7
Average annual percent change						
1973-87	—	8.3	—	11.1	—	5.8

¹ Separate counts of transplant patients by Medicare entitlement was not captured until the 1981 End Stage Renal Disease Facility Survey.

² 1973 data cover the period July 1 through December 31; Medicare end stage renal disease coverage became effective on July 1, 1973. The overall rate of growth is therefore calculated from 1974. For Medicare and non-Medicare transplants, the rate of growth is calculated from 1981.

NOTE: Average annual percent change calculated by use of compounding.

SOURCES: National Institute of Allergy and Infectious Diseases, National Institutes of Health: Medicare Health Insurance System counts, 1973-75. Social Security Administration, Bureau of Health Insurance: Data from the Facility Survey Tables, 1976-77. Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1981-87.

Table 14
Kidney transplants, by donor type: 1980-87

Year	Total		Donor type			
	Number	Percent Change	Cadaver Number	Percent change	Living related Number	Percent change
1980	4,697	—	3,422	—	1,275	—
1981	4,885	4.0	3,427	0.1	1,458	14.4
1982	5,358	9.7	3,681	7.4	1,677	15.0
1983	6,112	14.1	4,328	17.6	1,784	7.0
1984	6,968	14.0	5,264	21.6	1,704	-5.1
1985	7,695	10.4	5,819	10.5	1,876	10.1
1986	8,976	16.6	7,089	21.8	1,887	0.6
1987	8,967	-0.1	7,060	-0.4	1,907	1.1
Average annual percent change						
1980-87	—	9.7	—	10.9	—	5.9

NOTE: Average annual percent change calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1980-87.

Table 15
Patients awaiting transplants: 1980-87

Year	Number of patients	Percent increase	Percent of dialysis population
1980	5,072	—	9.7
1981	5,773	13.8	9.8
1982	6,720	16.4	10.2
1983	7,176	6.2	10.0
1984	8,562	19.9	10.9
1985	9,791	14.4	11.5
1986	11,108	13.5	12.2
1987	12,140	9.3	12.3
Average annual percent increase			
1980-87	—	13.3	—

NOTE: Average annual percent increase calculated by use of compounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1980-87.

End stage renal disease facility survey data

Information presented in Tables 16 through 29 was collected through the use of Form HCFA-2744, ESRD Facility Survey. All surveyed Medicare-approved providers of renal services are required to complete this form annually, covering the period January 1 through December 31.

The rate of compliance in completing the ESRD Facility Survey was 100 percent. It is important to note, however, that the number of facilities surveyed does not equal the number of Medicare-approved facilities in the country. Some ESRD hospitals were excluded from consideration because they provide only backup dialysis on an acute basis, rather than routine maintenance dialysis. Other facilities were not requested to complete an ESRD Facility Survey because they were so recently certified that there was insufficient time to include them

in the survey population. In addition, there are a number of facilities providing dialysis services which are not Medicare certified, such as several Veterans' Administration and Department of Defense facilities. These facilities are not included in the survey totals. Consequently, enrollment counts from the facility surveys are not directly comparable to enrollment counts from the Medicare enrollment files reported in Tables 6 through 10.

These tables are arrayed either nationally or by State. Aggregate dialysis patient population figures (end-of-survey period) are as of December 31. Other tables reflect activity for the entire survey period, unless otherwise noted. Some tables display patients by Medicare status: currently enrolled in Medicare, Medicare application pending, and non-Medicare. Patients appearing in the non-Medicare category may include those who are covered by the Veterans' Administration, those who are covered by private insurance (including those who have employer group health insurance coverage for the first year of ESRD, with Medicare becoming the primary insurer after the first year), those who are covered by Medicaid, and foreign nationals.

The data reported via the ESRD Facility Survey delineate totals for all patients with ESRD; that is, the data are not differentiated within the various treatment modalities between patients who have attained entitlement to Medicare benefits and those who have not.

Although we have no data to definitely indicate what portion of the patients in any particular treatment modality were recipients of Medicare benefits, we know through the ESRD Facility Survey that at the end of 1987, 87.14 percent of all patients were entitled to Medicare benefits; 5.68 percent had applications for Medicare entitlement pending; and 7.18 percent were not eligible for Medicare.

We estimate that approximately 200 home hemodialysis patients are not counted in the facility survey counts. This is due to reporting procedures for new health care delivery entities.

Table 16
End stage renal disease facilities surveyed and reporting, by State: 1987

State	Dialysis facility		Transplant center	
	Surveyed	Reporting	Surveyed	Reporting
Total	1,630	1,630	200	200
Alabama	32	32	2	2
Alaska	2	2	0	0
Arizona	31	31	4	4
Arkansas	23	23	2	2
California	196	196	19	19
Colorado	14	14	3	3
Connecticut	17	17	2	2
Delaware	4	4	0	0
District of Columbia	16	16	5	5
Florida	99	99	4	4
Georgia	56	56	5	5
Hawaii	10	10	1	1
Idaho	6	6	0	0
Illinois	67	67	8	8
Indiana	28	28	2	2
Iowa	13	13	4	4
Kansas	9	9	2	2
Kentucky	18	18	3	3
Louisiana	59	59	6	6
Maine	5	5	1	1
Maryland	38	38	3	3
Massachusetts	27	27	9	9
Michigan	38	38	10	10
Minnesota	21	21	4	4
Mississippi	23	23	1	1
Missouri	39	39	9	9
Montana	4	4	0	0
Nebraska	10	10	2	2
Nevada	4	4	0	0
New Hampshire	4	4	0	0
New Jersey	28	28	3	3
New Mexico	15	15	2	2
New York	107	107	13	13
North Carolina	35	35	5	5
North Dakota	5	5	0	0
Ohio	44	44	11	11
Oklahoma	28	28	5	5
Oregon	9	9	1	1
Pennsylvania	90	90	9	9
Puerto Rico	16	16	1	1
Rhode Island	6	6	0	0
South Carolina	34	34	1	1
South Dakota	8	8	0	0
Tennessee	52	52	4	4
Texas	116	116	16	16
Utah	13	13	3	3
Vermont	1	1	1	1
Virgin Islands	2	2	1	1
Virginia	49	49	3	3
Washington	16	16	5	5
West Virginia	14	14	2	2
Wisconsin	25	25	3	3
Wyoming	1	1	0	0
American Samoa	1	1	0	0
Guam	1	1	0	0
Mariana Islands	1	1	0	0

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 17
Dialysis patient eligibility status, by State: 1987

State	Facilities reporting	Total dialysis patients	Eligibility status		
			Currently enrolled in Medicare	Medicare application pending	Non-Medicare
Total	1,630	98,432	85,774	5,587	7,071
Alabama	32	2,081	1,889	61	131
Alaska	2	50	45	1	4
Arizona	31	1,401	1,131	91	179
Arkansas	23	895	819	45	31
California	196	11,098	9,385	589	1,124
Colorado	14	901	791	45	65
Connecticut	17	1,260	1,106	76	78
Delaware	4	301	239	41	21
District of Columbia	16	898	625	36	237
Florida	99	5,300	4,740	299	261
Georgia	56	3,062	2,749	99	214
Hawaii	10	562	490	39	33
Idaho	6	184	161	10	13
Illinois	67	4,452	3,737	402	313
Indiana	28	1,958	1,794	104	60
Iowa	13	735	682	30	23
Kansas	9	647	600	34	13
Kentucky	18	1,049	811	152	86
Louisiana	59	2,315	2,034	92	189
Maine	5	255	234	138	
Maryland	38	2,128	1,762	126	240
Massachusetts	27	2,130	1,839	121	170
Michigan	38	3,202	2,710	276	216
Minnesota	21	1,214	1,064	98	52
Mississippi	23	1,433	1,298	56	79
Missouri	39	1,993	1,780	138	75
Montana	4	210	195	10	5
Nebraska	10	438	417	5	16
Nevada	4	397	355	21	21
New Hampshire	4	218	200	10	8
New Jersey	28	3,733	3,245	169	319
New Mexico	15	559	471	38	50
New York	107	8,822	7,412	612	798
North Carolina	35	2,838	2,499	105	234
North Dakota	5	174	150	14	10
Ohio	44	3,601	3,088	311	202
Oklahoma	28	810	743	42	25
Oregon	9	714	661	28	25
Pennsylvania	90	5,307	4,730	268	309
Puerto Rico	16	1,305	1,168	7	130
Rhode Island	6	430	398	25	7
South Carolina	34	1,842	1,672	72	98
South Dakota	8	134	124	6	4
Tennessee	52	2,254	2,022	105	127
Texas	116	6,670	5,949	327	394
Utah	13	335	317	12	6
Vermont	1	90	85	4	1
Virgin Islands	2	40	27	4	9
Virginia	49	2,790	2,431	142	217
Washington	16	1,382	1,258	76	48
West Virginia	14	580	530	20	30
Wisconsin	25	1,165	1,043	74	48
Wyoming	1	26	22	3	1
American Samoa	1	14	13	0	1
Guam	1	35	19	3	13
Mariana Islands	1	15	15	0	0

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 18
Dialysis patient counts, by place of dialysis: United States, 1987

Patient count	Place of dialysis					
	Total	Percent	In-unit	Percent	Home	Percent
Dialysis patients beginning survey	90,939	-	73,826	81.18	17,113	18.82
Additions	58,573	-	50,319	85.91	8,254	14.09
New starts	36,659	62.59	31,092	61.79	5,567	67.45
Restarted	663	1.13	552	1.10	111	1.34
Transferred in	18,941	32.34	16,770	33.33	2,171	26.30
Returned after transplant	2,310	3.94	1,905	3.79	405	4.91
Losses	51,080	-	43,309	84.79	7,771	15.21
Deaths	22,186	43.43	18,671	43.11	3,515	45.23
Recovered function	1,286	2.52	1,135	2.62	151	1.94
Transplanted	7,756	15.18	5879	13.57	1,877	24.15
Transferred out	18,366	35.96	16,362	37.78	2,004	25.79
Discontinued dialysis	1,245	2.44	1,071	2.47	174	2.24
Lost to followup	241	0.47	191	0.44	50	0.64
Number needed to balance ¹	0	--	-687	--	687	--
Dialysis patients end of survey	98,432	-	80,149	81.43	18,283	18.57
Hemodialysis	83,095	84.42	79,513	99.21	3,582	19.59
Peritoneal dialysis	608	0.62	440	0.55	168	0.92
CAPD ²	13,000	13.21	175	0.22	12,825	70.15
CCPD ³	1,729	1.76	21	0.03	1,708	9.34
Medicare status	98,432	-	-	-	-	-
Medicare	85,774	87.14	-	-	-	-
Medicare pending	5,587	5.68	-	-	-	-
Non-Medicare	7,071	7.18	-	-	-	-

¹ Accurate counts are not always available because of the movement of home patients, self-care training, and in-unit backup dialysis.

² Continuous ambulatory peritoneal dialysis.

³ Continuous cycling peritoneal dialysis.

NOTE: Percents may not add to total because of rounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 19
Patients receiving care in-unit, by State: December 31, 1987

State	Facilities reporting	Total in-unit patients	Staff assisted dialysis		In-unit self-dialysis		Self-dialysis training			
			Hemo ¹	Peri ¹	Hemo ¹	Peri ¹	Hemo ¹	Peri ¹	CAPD ²	CCPD ³
Total	1,630	80,149	77,845	440	1,507	0	161	0	175	21
Alabama	32	1,703	1,688	0	5	0	3	0	6	1
Alaska	2	45	45	0	0	0	0	0	0	0
Arizona	31	1,092	1,033	0	49	0	7	0	2	1
Arkansas	23	645	628	11	1	0	2	0	3	0
California	196	9,927	9,724	4	174	0	14	0	8	3
Colorado	14	644	640	1	0	0	0	0	3	0
Connecticut	17	1,008	994	7	2	0	0	0	4	1
Delaware	4	235	228	0	1	0	0	0	6	0
District of Columbia	16	815	803	1	10	0	0	0	1	0
Florida	99	4,455	4,430	3	11	0	5	0	5	1
Georgia	56	2,542	2,465	20	47	0	0	0	9	1
Hawaii	10	487	378	0	108	0	0	0	1	0
Idaho	6	152	152	0	0	0	0	0	0	0
Illinois	67	3,905	3,608	47	241	0	4	0	5	0
Indiana	28	1,260	1,246	0	0	0	4	0	10	0
Iowa	13	509	509	0	0	0	0	0	0	0

See footnotes at end of table.

Table 19 - Continued
Patients receiving care in-unit, by State: December 31, 1987

State	Facilities reporting	Total in-unit patients	Staff assisted dialysis		In-unit self-dialysis		Self-dialysis training			
			Hemo ¹	Peri ²	Hemo ¹	Peri ²	Hemo ¹	Peri ²	CAPD ³	CCPD ⁴
Kansas	9	402	393	1	1	0	3	0	4	0
Kentucky	18	767	747	11	0	0	1	0	6	2
Louisiana	59	2,066	2,047	2	13	0	2	0	2	0
Maine	5	212	207	0	5	0	0	0	0	0
Maryland	38	1,727	1,638	3	82	0	1	0	3	0
Massachusetts	27	1,749	1,711	5	30	0	0	0	3	0
Michigan	38	2,312	2,217	28	39	0	9	0	19	0
Minnesota	21	938	937	1	0	0	0	0	0	0
Mississippi	23	1,121	1,105	12	3	0	1	0	0	0
Missouri	39	1,478	1,422	3	35	0	14	0	4	0
Montana	4	106	102	1	2	0	1	0	0	0
Nebraska	10	225	221	4	0	0	0	0	0	0
Nevada	4	295	294	0	0	0	1	0	0	0
New Hampshire	4	171	170	0	1	0	0	0	0	0
New Jersey	28	2,923	2,719	68	120	0	6	0	8	2
New Mexico	15	453	453	0	0	0	0	0	0	0
New York	107	7,397	7,046	80	225	0	24	0	20	2
North Carolina	35	2,174	2,165	0	0	0	2	0	7	0
North Dakota	5	146	146	0	0	0	0	0	0	0
Ohio	44	2,934	2,898	20	6	0	5	0	5	0
Oklahoma	28	594	588	5	0	0	1	0	0	0
Oregon	9	437	430	1	0	0	3	0	2	1
Pennsylvania	90	4,354	4,230	22	80	0	9	0	12	1
Puerto Rico	16	1,164	1,152	12	0	0	0	0	0	0
Rhode Island	6	387	387	0	0	0	0	0	0	0
South Carolina	34	1,665	1,606	0	54	0	5	0	0	0
South Dakota	8	123	123	0	0	0	0	0	0	0
Tennessee	52	1,749	1,735	0	8	0	3	0	1	2
Texas	116	5,744	5,635	38	53	0	8	0	8	2
Utah	13	245	234	0	10	0	0	0	1	0
Vermont	1	46	38	0	8	0	0	0	0	0
Virgin Islands	2	40	40	0	0	0	0	0	0	0
Virginia	49	2,349	2,286	4	47	0	7	0	4	1
Washington	16	888	862	4	8	0	13	0	1	0
West Virginia	14	422	417	3	0	0	2	0	0	0
Wisconsin	25	836	787	18	28	0	1	0	2	0
Wyoming	1	22	22	0	0	0	0	0	0	0
American Samoa	1	14	14	0	0	0	0	0	0	0
Guam	1	35	35	0	0	0	0	0	0	0
Mariana Islands	1	15	15	0	0	0	0	0	0	0

¹ Hemo is hemodialysis.

² Peri is peritoneal dialysis.

³ CAPD is continuous ambulatory peritoneal dialysis.

⁴ CCPD is continuous cycling peritoneal dialysis.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 20
Patients receiving care at home, by State: December 31, 1987

State	Facilities reporting	Total home patients	Hemodialysis	Peritoneal dialysis	CAPD ¹	CCPD ²
Total	1,630	18,283	3,582	168	12,825	1,708
Alabama	32	378	66	6	267	39
Alaska	2	5	5	0	0	0
Arizona	31	309	27	0	254	28
Arkansas	23	250	44	4	184	18
California	196	1,171	121	2	887	161
Colorado	14	257	68	12	171	6
Connecticut	17	252	21	0	223	8
Delaware	4	66	6	0	57	3
District of Columbia	16	83	1	0	64	18
Florida	99	845	232	0	468	145
Georgia	56	520	63	0	396	61
Hawaii	10	75	17	0	44	14
Idaho	6	32	17	0	15	0
Illinois	67	547	98	0	391	58
Indiana	28	698	123	0	565	10
Iowa	13	226	57	0	147	22
Kansas	9	245	45	0	196	4
Kentucky	18	282	31	1	237	13
Louisiana	59	249	31	1	192	25
Maine	5	43	8	0	30	5
Maryland	38	401	109	3	251	38
Massachusetts	27	381	65	0	255	61
Michigan	38	890	66	13	778	33
Minnesota	21	276	133	2	128	13
Mississippi	23	312	148	7	153	4
Missouri	39	515	83	18	383	31
Montana	4	104	39	0	57	8
Nebraska	10	213	6	0	185	22
Nevada	4	102	18	0	79	5
New Hampshire	4	47	5	0	37	5
New Jersey	28	810	145	5	574	86
New Mexico	15	106	3	0	97	6
New York	107	1,425	361	0	976	88
North Carolina	35	664	98	11	423	132
North Dakota	5	28	0	0	28	0
Ohio	44	667	45	2	547	73
Oklahoma	28	216	24	8	157	27
Oregon	9	277	57	0	208	12
Pennsylvania	90	953	107	3	720	123
Puerto Rico	16	141	44	0	93	4
Rhode Island	6	43	3	0	39	1
South Carolina	34	177	37	0	125	15
South Dakota	8	11	0	0	6	5
Tennessee	52	505	127	35	310	33
Texas	116	926	154	12	615	145
Utah	13	90	43	0	40	7
Vermont	1	44	15	0	29	0
Virgin Islands	2	0	0	0	0	0
Virginia	49	441	102	1	299	39
Washington	16	494	404	19	67	4
West Virginia	14	158	17	0	128	13
Wisconsin	25	329	43	3	246	37
Wyoming	1	4	0	0	4	0
American Samoa	1	0	0	0	0	0
Guam	1	0	0	0	0	0
Mariana Islands	1	0	0	0	0	0

¹ Continuous ambulatory peritoneal dialysis.

² Continuous cycling peritoneal dialysis.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 21
Dialysis treatment setting of end stage renal disease patients, by State: 1987

State	Facilities reporting	Total dialysis patients	Dialyzed in-unit		Dialyzed at home	
			Total	Percent	Total	Percent
Total	1,630	98,432	80,149	81.4	18,283	18.6
Alabama	32	2,081	1,703	81.8	378	18.2
Alaska	2	50	45	90.0	5	10.0
Arizona	31	1,401	1,092	77.9	309	22.1
Arkansas	23	895	645	72.1	250	27.9
California	196	11,098	9,927	89.4	1,171	10.6
Colorado	14	901	644	71.5	257	28.5
Connecticut	17	1,260	1,008	80.0	252	20.0
Delaware	4	301	235	78.1	66	21.9
District of Columbia	16	898	815	90.8	83	9.2
Florida	99	5,300	4,455	84.1	845	15.9
Georgia	56	3,062	2,542	83.0	520	17.0
Hawaii	10	562	487	86.7	75	13.3
Idaho	6	184	152	82.6	32	17.4
Illinois	67	4,452	3,905	87.7	547	12.3
Indiana	28	1,958	1,260	64.4	698	35.6
Iowa	13	735	509	69.3	226	30.7
Kansas	9	647	402	62.1	245	37.9
Kentucky	18	1,049	767	73.1	282	26.9
Louisiana	59	2,315	2,066	89.2	249	10.8
Maine	5	255	212	83.1	43	16.9
Maryland	38	2,128	1,727	81.2	401	18.8
Massachusetts	27	2,130	1,749	82.1	381	17.9
Michigan	38	3,202	2,312	72.2	890	27.8
Minnesota	21	1,214	938	77.3	276	22.7
Mississippi	23	1,433	1,121	78.2	312	21.8
Missouri	39	1,993	1,478	74.2	515	25.8
Montana	4	210	106	50.5	104	49.5
Nebraska	10	438	225	51.4	213	48.6
Nevada	4	397	295	74.3	102	25.7
New Hampshire	4	218	171	78.4	47	21.6
New Jersey	28	3,733	2,923	78.3	810	21.7
New Mexico	15	559	453	81.0	106	19.0
New York	107	8,822	7,397	83.8	1,425	16.2
North Carolina	35	2,838	2,174	76.6	664	23.4
North Dakota	5	174	146	83.9	28	16.1
Ohio	44	3,601	2,934	81.5	667	18.5
Oklahoma	28	810	594	73.3	216	26.7
Oregon	9	714	437	61.2	277	38.8
Pennsylvania	90	5,307	4,354	82.0	953	18.0
Puerto Rico	16	1,305	1,164	89.2	141	10.8
Rhode Island	6	430	387	90.0	43	10.0
South Carolina	34	1,842	1,665	90.4	177	9.6
South Dakota	8	134	123	91.8	11	8.2
Tennessee	52	2,254	1,749	77.6	505	22.4
Texas	116	6,670	5,744	86.1	926	13.9
Utah	13	335	245	73.1	90	26.9
Vermont	1	90	46	51.1	44	48.9
Virgin Islands	2	40	40	100.0	0	0.0
Virginia	49	2,790	2,349	84.2	441	15.8
Washington	16	1,382	888	64.3	494	35.7
West Virginia	14	580	422	72.8	158	27.2
Wisconsin	25	1,165	836	71.8	329	28.2
Wyoming	1	26	22	84.6	4	15.4
American Samoa	1	14	14	100.0	0	0.0
Guam	1	35	35	100.0	0	0.0
Mariana Islands	1	15	15	100.0	0	0.0

NOTE: Percents may not add to total because of rounding.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 22
Patients completing a self-dialysis training course during the calendar year, by State: 1987

State	Facilities reporting	Total patients	Home hemodialysis	In-unit self-hemodialysis	Home peritoneal dialysis	In-unit self peritoneal dialysis	CAPD ¹	CCPD ²
Total	816	9,928	823	447	212	4	7,184	1,258
Alabama	21	204	16	1	5	0	157	25
Alaska	1	3	3	0	0	0	0	0
Arizona	18	230	4	35	0	0	169	22
Arkansas	15	144	12	0	6	0	114	12
California	91	679	21	51	0	0	512	95
Colorado	9	104	16	0	5	0	76	7
Connecticut	12	138	2	0	0	0	125	11
Delaware	1	47	1	0	0	0	44	2
District of Columbia	6	49	0	7	0	0	32	10
Florida	43	447	14	6	0	0	301	126
Georgia	32	341	20	3	0	0	280	38
Hawaii	2	85	45	8	0	0	25	7
Idaho	1	3	1	0	0	0	2	0
Illinois	31	364	18	31	0	0	258	57
Indiana	17	288	33	0	0	0	246	9
Iowa	11	87	9	0	0	0	67	11
Kansas	6	122	11	0	1	4	105	1
Kentucky	11	114	5	0	2	0	98	9
Louisiana	17	162	11	8	1	0	120	22
Maine	3	20	0	1	0	0	16	3
Maryland	16	156	5	13	2	0	114	22
Massachusetts	21	206	8	2	0	0	157	39
Michigan	28	526	15	13	14	0	455	29
Minnesota	7	156	61	0	0	0	84	11
Mississippi	6	104	21	0	2	0	77	4
Missouri	22	278	23	6	7	0	219	23
Montana	4	52	13	2	0	0	35	2
Nebraska	3	121	0	0	37	0	71	13
Nevada	3	81	10	0	0	0	68	3
New Hampshire	3	21	1	0	0	0	18	2
New Jersey	20	469	8	56	5	0	314	86
New Mexico	7	47	2	0	6	0	35	4
New York	54	696	49	78	0	0	491	78
North Carolina	16	389	19	0	9	0	261	100
North Dakota	4	23	0	0	0	0	23	0
Ohio	27	378	10	0	6	0	311	51
Oklahoma	8	134	5	0	7	0	106	16
Oregon	8	157	41	0	0	0	107	9
Pennsylvania	52	552	16	40	3	0	392	101
Puerto Rico	5	96	11	0	0	0	81	4
Rhode Island	3	16	1	0	0	0	15	0
South Carolina	11	160	25	32	0	0	85	18
South Dakota	1	11	0	0	0	0	4	7
Tennessee	14	317	44	10	65	0	173	25
Texas	51	406	13	25	2	0	290	76
Utah	7	40	7	0	0	0	29	4
Vermont	1	19	4	2	0	0	13	0
Virgin Islands	0	0	0	0	0	0	0	0
Virginia	28	211	18	13	0	0	152	28
Washington	9	192	133	3	21	0	33	2
West Virginia	9	94	6	0	0	0	78	10
Wisconsin	19	185	12	1	6	0	142	24
Wyoming	1	4	0	0	0	0	4	0
American Samoa	0	0	0	0	0	0	0	0
Guam	0	0	0	0	0	0	0	0
Mariana Islands	0	0	0	0	0	0	0	0

¹ Continuous ambulatory peritoneal dialysis.

² Continuous cycling peritoneal dialysis.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 23
In-unit dialysis treatments given during the calendar year, by State: 1987

State	Facilities reporting	Total treatments ¹	Hemodialysis		Peritoneal dialysis	
			Staff assisted	In-unit self	Staff assisted	In-unit self
Total	1,630	10,871,494	10,577,617	221,713	66,582	5,582
Alabama	32	229,679	228,736	920	23	0
Alaska	2	6,341	6,341	0	0	0
Arizona	31	141,466	132,653	8,730	83	0
Arkansas	23	88,316	86,306	144	1,766	100
California	196	1,332,489	1,301,710	27,398	1,350	2,031
Colorado	14	88,763	88,656	0	89	18
Connecticut	17	140,931	135,310	2,289	3,202	130
Delaware	4	31,987	31,831	156	0	0
Distrcit of Columbia	16	116,455	109,162	1,057	6,143	93
Florida	99	623,008	620,764	2,122	122	0
Georgia	56	366,060	356,207	6,532	3,321	0
Hawaii	10	68,125	52,854	15,271	0	0
Idaho	6	18,151	18,151	0	0	0
Illinois	67	515,134	475,964	34,964	4,206	0
Indiana	28	161,453	161,453	0	0	0
Iowa	13	68,121	67,604	0	493	24
Kansas	9	55,432	55,326	0	106	0
Kentucky	18	104,458	103,076	2	1,378	2
Louisiana	59	276,993	275,611	1,011	371	0
Maine	5	28,809	28,172	637	0	0
Maryland	38	220,691	210,687	9,318	686	0
Massachusetts	27	241,824	236,314	4,143	1,367	0
Michigan	38	311,346	300,432	6,534	4,372	8
Minnesota	21	123,558	123,158	0	400	0
Mississippi	23	160,031	159,227	339	465	0
Missouri	39	197,697	190,301	5,632	1,764	0
Montana	4	15,015	14,670	307	37	1
Nebraska	10	29,800	29,106	0	694	0
Nevada	4	40,729	40,729	0	0	0
New Hampshire	4	23,774	23,774	0	0	0
New Jersey	28	389,238	362,985	17,243	9,010	0
New Mexico	15	61,525	61,400	0	99	26
New York	107	1,007,844	968,169	32,210	7,465	0
North Carolina	35	306,421	306,225	0	196	0
North Dakota	5	18,670	18,670	0	0	0
Ohio	44	372,031	369,141	1,083	1,807	0
Oklahoma	28	81,292	80,584	0	708	0
Oregon	9	58,797	58,688	0	109	0
Pennsylvania	90	591,659	574,712	12,258	4,643	46
Puerto Rico	16	167,098	165,995	0	1,103	0
Rhode Island	6	57,308	57,308	0	0	0
South Carolina	34	216,156	205,846	7,341	5	2,964
South Dakota	8	17,596	17,596	0	0	0
Tennessee	52	222,117	221,348	511	258	0
Texas	116	804,904	791,204	8,167	5,470	63
Utah	13	41,737	40,106	1,631	0	0
Vermont	1	6,656	5,468	1,188	0	0
Virgin Islands	2	3,578	3,578	0	0	0
Virginia	49	314,609	307,135	6,694	780	0
Washington	16	125,492	124,256	832	404	0
West Virginia	14	60,041	59,403	0	638	0
Wisconsin	25	106,757	100,307	4,925	1,449	76
Wyoming	1	3,124	3,124	0	0	0
American Samoa	1	1,984	1,984	0	0	0
Guam	1	6,067	5,943	124	0	0
Mariana Islands	1	2,157	2,157	0	0	0

¹ Does not include training treatments.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 24
Dialysis training treatments given during the calendar year, by State: 1987

State	Facilities reporting	Total training treatments	Hemodialysis	Peritoneal dialysis	CAPD ¹	CCPD ²
Total	1,630	115,336	36,901	1,947	67,164	9,324
Alabama	32	1,715	232	34	1,299	150
Alaska	2	35	35	0	0	0
Arizona	31	2,322	788	33	1,336	165
Arkansas	23	1,748	324	67	1,224	133
California	196	9,787	3,216	0	5,861	710
Colorado	14	1,110	415	38	633	24
Connecticut	17	3,190	95	0	3,033	62
Delaware	4	344	7	0	324	13
District of Columbia	16	821	108	0	625	88
Florida	99	3,946	819	0	2,319	808
Georgia	56	2,880	344	0	2,221	315
Hawaii	10	504	136	0	316	52
Idaho	6	129	117	0	12	0
Illinois	67	3,672	1,634	0	1,794	244
Indiana	28	2,501	576	0	1,854	71
Iowa	13	1,190	332	0	731	127
Kansas	9	1,228	220	12	992	4
Kentucky	18	1,019	203	38	721	57
Louisiana	59	1,480	458	14	876	132
Maine	5	184	46	0	112	26
Maryland	38	2,085	670	87	1,128	200
Massachusetts	27	1,833	189	0	1,408	236
Michigan	38	5,036	800	76	3,934	226
Minnesota	21	1,373	679	0	597	97
Mississippi	23	1,011	384	50	553	24
Missouri	39	3,114	1,477	73	1,330	234
Montana	4	560	253	0	300	7
Nebraska	10	868	0	367	481	20
Nevada	4	2,031	340	0	1,677	14
New Hampshire	4	263	7	0	248	8
New Jersey	28	6,731	1,805	44	4,065	817
New Mexico	15	385	20	30	315	20
New York	107	12,363	5,656	20	5,804	883
North Carolina	35	2,592	421	208	1,729	234
North Dakota	5	157	0	0	157	0
Ohio	44	4,226	473	76	3,158	519
Oklahoma	28	1,269	40	75	955	199
Oregon	9	1,375	460	0	870	45
Pennsylvania	90	5,147	1,251	42	3,078	776
Puerto Rico	16	1,298	297	0	964	37
Rhode Island	6	242	8	0	234	0
South Carolina	34	2,304	1,752	0	478	74
South Dakota	8	59	0	0	18	41
Tennessee	52	2,633	1,065	446	1,019	103
Texas	116	4,667	1,279	14	2,580	794
Utah	13	310	53	0	219	38
Vermont	1	190	128	0	62	0
Virgin Island	2	0	0	0	0	0
Virginia	49	2,965	1,233	0	1,511	221
Washington	16	6,108	5,584	78	426	20
West Virginia	14	841	223	0	530	88
Wisconsin	25	1,463	249	25	1,021	168
Wyoming	1	32	0	0	32	0
American Samoa	1	0	0	0	0	0
Guam	1	0	0	0	0	0
Mariana Islands	1	0	0	0	0	0

¹ Continuous ambulatory peritoneal dialysis.

² Continuous cycling peritoneal dialysis.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 25
Kidney transplant activity during the calendar year:
United States, 1987

Category	Number
Transplants performed at center	8,967
Living donor	1,907
Cadaveric donor	7,060
Patients awaiting transplant	12,140
Dialysis	11,557
Non-dialysis	583
Patients who received transplant at center	8,949
Medicare status	8,949
Medicare	7,832
Medicare pending	466
Non-Medicare	651

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 26
Disposition of cadaveric kidneys, by source: United States, 1987

Source	Total	Disposition of cadaveric kidneys		
		Transplanted at center	Sent to another center	Not used
Total	10,127	7,078	2,651	398
Harvested at center	2,517	1,277	1,101	139
Obtained from other center/organ procurement agency	3,928	3,478	372	78
Obtained from nontransplant hospital	3,682	2,323	1,178	181

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 27
Kidney transplant center patient eligibility status, by State: 1987

State	Centers reporting	Total transplant patients	Currently enrolled in Medicare	Medicare application pending	Non-Medicare
Total	200	8,949	7,832	466	651
Alabama	2	218	200	12	6
Arizona	4	139	112	17	10
Arkansas	2	40	36	3	1
California	19	1,140	938	62	140
Colorado	3	104	100	0	4
Connecticut	2	103	95	2	6
District of Columbia	5	220	143	16	61
Florida	4	365	341	13	11
Georgia	5	264	251	9	4
Hawaii	1	22	21	0	1
Illinois	8	376	338	9	29
Indiana	2	132	126	4	2
Iowa	4	89	85	2	2
Kansas	2	62	52	8	2
Kentucky	3	109	91	3	15
Louisiana	6	165	143	2	20
Maine	1	34	32	1	1
Maryland	3	87	86	1	0
Massachusetts	9	279	189	47	43
Michigan	10	323	305	16	2
Minnesota	4	304	242	22	40
Mississippi	1	28	25	2	1
Missouri	9	278	250	20	8
Nebraska	2	43	35	5	3
New Jersey	3	103	101	0	2
New Mexico	2	58	55	3	0
New York	13	542	471	10	61
North Carolina	5	229	210	1	18
Ohio	11	527	450	51	26
Oklahoma	5	95	82	12	1
Oregon	1	133	123	6	4
Pennsylvania	9	584	531	29	24
Puerto Rico	1	31	29	0	2
South Carolina	1	68	68	0	0
Tennessee	4	220	202	7	11
Texas	16	681	579	42	60
Utah	3	144	127	16	1
Vermont	1	20	18	2	0
Virgin Islands	1	0	0	0	0
Virginia	3	108	105	1	2
Washington	5	171	167	3	1
West Virginia	2	26	24	1	1
Wisconsin	3	285	254	6	25

NOTE: The following States have no Medicare-approved transplant centers: Alaska, Delaware, Idaho, Montana, Nevada, New Hampshire, North Dakota, Rhode Island, South Dakota, Wyoming, American Samoa, Guam, and Mariana Islands.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 28
Number of kidney transplants performed and type of donor, by State: 1987

State	Centers reporting	Total patients	Total transplants	Living donor		Cadaveric donor	
				Total	Percent	Total	Percent
Total	200	8,949	8,967	1,907	21.3	7,060	78.7
Alabama	2	218	218	52	23.9	166	76.1
Arizona	4	139	139	15	10.8	124	89.2
Arkansas	2	40	40	20	50.0	20	50.0
California	19	1,140	1,140	209	18.3	931	81.7
Colorado	3	104	104	13	12.5	91	87.5
Connecticut	2	103	105	32	30.5	73	69.5
District of Columbia	5	220	221	33	14.9	188	85.1
Florida	4	365	366	58	15.8	308	84.2
Georgia	5	264	264	88	33.3	176	66.7
Hawaii	1	22	22	3	13.6	19	86.4
Illinois	8	376	378	68	18.0	310	82.0
Indiana	2	132	133	42	31.6	91	68.4
Iowa	4	89	89	15	16.9	74	83.1
Kansas	2	62	62	6	9.7	56	90.3
Kentucky	3	109	109	31	28.4	78	71.6
Louisiana	6	165	165	46	27.9	119	72.1
Maine	1	34	34	10	29.4	24	70.6
Maryland	3	87	87	17	19.5	70	80.5
Massachusetts	9	279	279	93	33.3	186	66.7
Michigan	10	323	323	67	20.7	256	79.3
Minnesota	4	304	304	100	32.9	204	67.1
Mississippi	1	28	28	0	0.0	28	100.0
Missouri	9	278	280	67	23.9	213	76.1
Nebraska	2	43	43	3	7.0	40	93.0
New Jersey	3	103	103	11	10.7	92	89.3
New Mexico	2	58	58	10	17.2	48	82.8
New York	13	542	542	110	20.3	432	79.7
North Carolina	5	229	229	47	20.5	182	79.5
Ohio	11	527	527	106	20.1	421	79.9
Oklahoma	5	95	95	26	27.4	69	72.6
Oregon	1	133	135	32	23.7	103	76.3
Pennsylvania	9	584	586	63	10.8	523	89.2
Puerto Rico	1	31	31	11	35.5	20	64.5
South Carolina	1	68	69	19	27.5	50	72.5
Tennessee	4	220	220	64	29.1	156	70.9
Texas	16	681	684	143	20.9	541	79.1
Utah	3	144	144	28	19.4	116	80.6
Vermont	1	20	20	5	25.0	15	75.0
Virgin Islands	1	0	0	0	0.0	0	0.0
Virginia	3	108	108	22	20.4	86	79.6
Washington	5	171	172	44	25.6	128	74.4
West Virginia	2	26	26	5	19.2	21	80.8
Wisconsin	3	285	285	73	25.6	212	74.4

NOTE: Percents may not add to total because of rounding. The following States have no Medicare-approved kidney transplant centers: Alaska, Delaware, Idaho, Montana, Nevada, New Hampshire, North Dakota, Rhode Island, South Dakota, Wyoming, American Samoa, Guam, and Mariana Islands.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Table 29
Distribution of kidney transplants, by State and number of transplants: 1987

State	Centers reporting	Total transplants	0-15		16-50		51-100		101-200		201 or more	
			Total	Percent	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Total	200	8,967	45	22.5	94	47.0	42	21.0	16	90.0	3	1.5
Alabama	2	218	1	50.0	0	0.0	0	0.0	0	0.0	1	50.0
Arizona	4	139	2	50.0	1	25.0	0	0.0	1	25.0	0	0.0
Arkansas	2	40	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0
California	19	1,140	3	15.8	9	47.4	4	21.1	1	5.3	2	10.5
Colorado	3	104	0	0.0	2	66.7	1	33.3	0	0.0	0	0.0
Connecticut	2	105	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0
District of Columbia	5	221	2	40.0	2	40.0	0	0.0	1	20.0	0	0.0
Florida	4	366	0	0.0	1	25.0	1	25.0	2	50.0	0	0.0
Georgia	5	264	1	20.0	1	20.0	2	40.0	1	20.0	0	0.0
Hawaii	1	22	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Illinois	8	378	1	12.5	4	50.0	3	37.5	0	0.0	0	0.0
Indiana	2	133	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0
Iowa	4	89	3	75.0	0	0.0	1	25.0	0	0.0	0	0.0
Kansas	2	62	0	0.0	2	100.0	0	0.0	0	0.0	0	0.0
Kentucky	3	109	1	33.3	1	33.3	1	33.3	0	0.0	0	0.0
Louisiana	6	165	2	33.3	4	66.7	0	0.0	0	0.0	0	0.0
Maine	1	34	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Maryland	3	87	0	0.0	3	100.0	0	0.0	0	0.0	0	0.0
Massachusetts	9	279	3	33.3	3	33.3	3	33.3	0	0.0	0	0.0
Michigan	10	323	3	30.0	5	50.0	2	20.0	0	0.0	0	0.0
Minnesota	4	304	0	0.0	2	50.0	1	25.0	1	25.0	0	0.0
Mississippi	1	28	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Missouri	9	280	2	22.2	6	66.7	1	11.1	0	0.0	0	0.0
Nebraska	2	43	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0
New Jersey	3	103	1	33.3	2	66.7	0	0.0	0	0.0	0	0.0
New Mexico	2	58	0	0.0	2	100.0	0	0.0	0	0.0	0	0.0
New York	13	542	3	23.1	7	53.8	2	15.4	1	7.7	0	0.0
North Carolina	5	229	0	0.0	3	60.0	2	40.0	0	0.0	0	0.0
Ohio	11	527	3	27.3	3	27.3	4	36.4	1	9.1	0	0.0
Oklahoma	5	95	2	40.0	3	60.0	0	0.0	0	0.0	0	0.0
Oregon	1	135	0	0.0	0	0.0	0	0.0	1	100.00	0	0.0
Pennsylvania	9	586	1	11.1	3	33.3	3	33.3	2	22.2	0	0.0
Puerto Rico	1	31	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
South Carolina	1	69	0	0.0	0	0.0	1	100.0	0	0.0	0	0.0
Tennessee	4	220	1	25.0	1	25.0	1	25.0	1	25.0	0	0.0
Texas	16	684	3	18.8	8	50.0	3	18.8	2	12.5	0	0.0
Utah	3	144	1	33.3	0	0.0	2	66.7	0	0.0	0	0.0
Vermont	1	20	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0
Virgin Islands	1	0	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0
Virginia	3	108	0	0.0	3	100.0	0	0.0	0	0.0	0	0.0
Washington	5	172	1	20.0	3	60.0	1	20.0	0	0.0	0	0.0
West Virginia	2	26	1	50.0	1	50.0	0	0.0	0	0.0	0	0.0
Wisconsin	3	285	1	33.3	0	0.0	1	33.3	1	33.3	0	0.0

NOTES: Percents may not add to totals because of rounding. The following States have no Medicare-approved kidney transplant centers: Alaska, Delaware, Idaho, Montana, Nevada, New Hampshire, North Dakota, Rhode Island, South Dakota, Wyoming, American Samoa, Guam, and Mariana Islands.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the End Stage Renal Disease Facility Survey, 1987.

Veterans' Administration dialysis statistics

As of December 31, 1987, there were 58 Veterans' Administration dialysis centers and 27 Veterans' Administration satellite centers reporting the status of dialysis patients. The statistics displayed in Table 30 include 733 patients (excluding acute dialysis) who were dialyzing in 14 Medicare-approved Veterans' Administration facilities.

Data on the number of continuous ambulatory peritoneal dialysis (CAPD) patients are not captured as a

separate category. However, it is presumed that a large portion of the 16 percent of peritoneal patients are on CAPD.

Between 1986 and 1987, the number of patients receiving dialysis in all modalities decreased from 3,853 to 3,754 -- a net decline of 2.6 percent. The number of patients dialyzing at home also declined from 1,075 in 1986 to 985 in 1987. The home dialysis patients comprised 28 percent of the total Veterans' Administration dialysis population in 1986, but only 26 percent of the total in 1987.

Table 30
Number of patients for Veterans' Administration dialysis activities, by type of dialysis: 1986-87

Type of dialysis	Dialysis center patients	Satellite dialysis center patients December 1986	Contract fee	Dialysis center patients	Satellite dialysis center patients December 1987	Contract fee
All modalities	2,893	302	--	2,818	339	--
Acute hemodialysis	87	24	--	90	27	--
Acute peritoneal dialysis	5	0	--	2	0	--
Assisted hemodialysis	1,437	236	--	1,569	253	--
Assisted peritoneal dialysis	48	1	--	42	0	--
Limited hemodialysis	240	5	--	146	8	--
Limited peritoneal dialysis	3	0	--	1	1	--
Home self-hemodialysis training	27	1	--	23	0	--
Home self-peritoneal dialysis training	6	0	--	4	6	--
Home hemodialysis	488	15	--	432	10	--
Home peritoneal dialysis	552	20	--	509	34	--
Contract fee dialysis	--	--	658	--	--	597
Hemodialysis	--	--	624	--	--	578
Peritoneal dialysis	--	--	34	--	--	19

SOURCE: Veterans' Administration, Department of Medicine and Surgery: Data from the Division of Clinical Affairs, Medical Service Section, 1986-87.

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EFFECT OF TRANSPLANTATION ON THE MEDICARE END-STAGE RENAL DISEASE PROGRAM

PAUL W. EGGERS, PH.D.

Abstract The Medicare end-stage renal disease program has received considerable attention as a model of government funding for high-cost medical treatment. This paper examines how the program has been influenced by renal transplantation.

In the past decade, the number of kidney transplantations has increased substantially, and the success rate of these procedures has improved. From 1980 to 1985, the number of transplantations increased by 10 percent per year. During that time, the survival rates for grafts from cadavers and living related donors increased by 7 and 3 percent, respectively, in part because of the introduction of cyclosporine. As a result, the fastest-growing group of beneficiaries of the Medicare end-stage renal disease program are those with functioning grafts. As of the end of 1985, these patients accounted for 18 percent of all ben-

eficiaries and 32 percent of all beneficiaries less than 55 years of age. In the youngest groups, transplantation has reached a level sufficient to reduce the absolute numbers of patients on dialysis, beginning in 1983. Increases in transplantation are not evenly distributed among subgroups of beneficiaries. Relatively few patients 65 years of age and older receive transplants; blacks receive transplants at a rate roughly half that among whites, but the rate is increasing.

Because the costs of maintaining patients with functioning grafts are only one third of those for patients on dialysis and because the quality of life is usually much better, renal transplantation is causing a convergence of the best clinical and economic outcomes for patients with end-stage renal disease. (*N Engl J Med* 1988; 318: 223-9.)

SINCE its inception in 1973, the Medicare end-stage renal disease program has been the subject of much controversy. The program has been criticized for poor management,¹⁻⁵ unequal access to care,⁴ and lack of timely data.^{5,6} Perhaps most important, however, is concern about the cost of the program.^{1,3,6,7} Early estimates were that the cost would level off at about \$1 billion per year, but by 1979 the annual cost of the program had reached that figure, and by 1984 it approached \$2 billion.⁸ Current estimates from the Health Care Financing Administration's Office of the Actuary are that annual expenditures for the program will reach \$3 billion by 1989.⁹ Early estimates of the growth of the program were unrealistically low,^{1,10} and discussions of the effect of medical technology on health care costs often cite the program as the prime example of the unforeseen cost of funding an expensive treatment.^{7,11}

It is generally thought that kidney transplantation not only produces a clinical outcome superior to that of maintenance dialysis but is cost effective as well. Many studies have shown that despite the high initial cost of transplantation, its long-term cost is less than that of dialysis.¹²⁻¹⁴ In addition, there is evidence that the quality of life is better for the recipients of successful transplants than for patients on dialysis.¹⁵

In the face of increasing costs for this program, considerable attention has been given to ways to encourage kidney transplantation as an alternative to renal dialysis. The 1978 end-stage renal disease program amendments (P.L. 95-292) included provisions designed to increase rates of transplantation, such as the

extension of eligibility for benefits from one to three years after transplantation and increased coverage for the costs of acquiring kidneys. In 1984 Congress passed the National Organ Transplant Act (P.L. 98-507), which authorized grants to organ-procurement agencies and a national organ-sharing system. In 1986 the Office of Organ Transplantation of the Public Health Service awarded 40 grants to organ-procurement agencies and a contract for the national organ-sharing network. In addition, the 1984 act established a task force on organ transplantation to examine the medical, legal, ethical, economic, and social issues raised by the procurement of human organs. This task force has presented two reports to Congress on its deliberations.^{16,17} In the Omnibus Budget Reconciliation Act of 1986 (P.L. 99-509), Congress has added a further incentive to kidney transplantation by mandating Medicare coverage of immunosuppressive drugs for one year after the procedure.

The purpose of this paper is to address the effect of kidney transplantation on the Medicare end-stage renal disease program. Particular attention will be paid to the implications of changes in both the number of transplantations and their success rate, as they relate to program enrollment and costs.

METHODS

Data for this study were obtained from the end-stage renal disease program's management and medical-information system, a longitudinal file of patients with end-stage renal disease who are entitled to Medicare benefits, which is maintained by the Bureau of Data Management and Strategy at the Health Care Financing Administration. Medicare's entitlement and claims records were used to determine patients' age, sex, race, residence, and dates of eligibility. Data also came from specific forms used for patients with end-stage renal disease, primarily the Chronic Renal Disease Medical Evidence Report (HCFA 2728-U4), which lists the cause and date of renal failure, and the Transplant Information form (HCFA 2745-U3), from which the date of the transplantation and the type

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of donor (cadaver or living relative) were obtained. The date of failure of a renal graft was calculated from two sources. If the graft failed before 1982, the date was determined by a method developed with the cooperation of the National Cancer Institute, which compared the hemodialysis regimen of transplant recipients with that of patients who had never received a transplant. When the number of hemodialysis sessions of a transplant recipient fell within the normal range for patients who had never received a transplant within any calendar quarter, the recipient was considered to have returned to dialysis at the midpoint of that quarter.

Beginning in 1982, a transplant follow-up form, designed in cooperation with the National Institutes of Health, has been used to monitor transplants. The rate of response with this form has been very good, and the exact date of graft failure was used whenever this form was available.

Patients were counted as new enrollees in the Medicare end-stage renal disease program if they had end-stage renal failure and were entitled to Medicare benefits within a calendar year. Although eligibility for Medicare ordinarily begins during the month of one's 65th birthday, renal failure may not occur for a number of years thereafter. Patients over 65 years of age were included in the counts of program enrollees as of the date of end-stage renal failure, which was defined as the date when maintenance dialysis began.

Although some patients under the age of 65 have Medicare disability coverage before renal failure, entitlement to Medicare benefits usually results from renal failure. For these patients there is a three-month waiting period between renal failure and the beginning of Medicare benefits. This waiting period is waived if a patient receives a kidney transplant or begins self-dialysis training. Patients in these groups were included in counts of those entering the program as of the date when renal failure had occurred and Medicare entitlement had begun. In other words, a person must have had end-stage renal failure and been entitled to Medicare benefits to be included in counts of new program enrollees. In calculating the numbers of patients becoming eligible for program coverage, no distinction was made between patients receiving dialysis and those receiving transplants. Not included in this study are the 6 percent of patients with end-stage renal disease who do not qualify for Medicare. Program enrollment is the total number of persons with end-stage renal disease who were entitled to Medicare benefits as of December 31 of a given year, regardless of when they became eligible for coverage.

For the purposes of this paper, a distinction is made between patients on dialysis and patients with functioning kidney grafts. Patients with functioning grafts are defined as those who received a transplant before December 31 and who had not died or had graft rejection by that date. Patients whose grafts have functioned for three full years lose Medicare entitlement if their Medicare entitlement was due solely to end-stage renal disease. Those whose entitlement was due to disability retain their entitlement pending disability review. Patients on dialysis include those who had renal failure before December 31 in a given year and who either never had a transplant or had a transplant that failed. Patients who received more than one transplant were classified according to the status of the most recent transplant.

RESULTS

Trends in Transplantation

There have been two notable trends in transplantation over the past decade. The first has been a substantial increase in the number of transplantations performed. The second has been an increase in the survival rate of kidney grafts. Results of an annual survey by the Health Care Financing Administration show that the total number of kidney transplantations performed in the United States increased from 4697 in 1980 to 7695 in 1985, an average annual increase of 10.4 percent (HCFA: unpublished data). From 1974 to 1980, the average annual increase was only 6.7 percent.

At the same time, the outcomes of transplantation were improving. Table 1 shows the one-year survival rate of grafts from cadavers and living related donors, from 1977 through 1984. It is evident that survival has improved markedly for grafts from both types of donor. In 1977, only about half (53 percent) of kidney grafts from cadavers could be expected to survive one year after transplantation; by 1984, however, 68 percent could be expected to survive for one year. The trend for grafts from living related donors was the same: one-year survival improved from 78 percent in 1977 to 88 percent in 1984. The total number of grafts surviving for one year rose from 653 and 207 in 1977, for grafts from cadavers and living related donors, respectively, to 3103 and 1376 in 1984.

Although there was a general improvement in survival rates throughout these years, the most notable increase was in the survival of transplants from cadavers between 1983 and 1984, from 62 to 68 percent. This increase was probably due to the widespread use of cyclosporine, which was approved for use by the Food and Drug Administration in November 1983 and was widely used throughout 1984. Analysis of the effect of cyclosporine has shown that the survival rate for grafts was 8 percent higher when cyclosporine was used than with conventional immunosuppressive therapy (71 vs. 63 percent).¹⁸ Other studies have also shown improved survival rates for grafts with the use of cyclosporine.¹⁹ In 1983, cyclosporine was used with only 10 percent of transplants from cadavers; in 1984, this figure rose to 70 percent. Thus, the jump in survival rates for grafts from 1983 to 1984 is consistent with the effectiveness of cyclosporine and the rapid dissemination of its use. Cyclosporine has thus reinforced the historical trend toward better outcomes in transplantation of kidneys from cadavers.

Table 2 shows the characteristics of Medicare beneficiaries who received kidney transplants in 1985. There is a clear age difference between patients who received kidneys from cadavers and those who received them from living related donors. The recipients of kidneys from cadavers were seven years older, on

Table 1. Survival of Kidney Transplant Grafts after One Year, 1977 through 1984.*

YEAR	SURVIVAL AFTER ONE YEAR	
	GRAFTS FROM CADAVER	GRAFTS FROM LIVING RELATED DONORS
	percent (no.)	
1977	53 (1232)	78 (265)
1978	54 (1885)	76 (565)
1979	57 (2182)	80 (824)
1980	61 (2454)	85 (861)
1981	63 (2729)	85 (1138)
1982	61 (3258)	85 (1118)
1983	62 (3830)	86 (1224)
1984	68 (4563)	88 (1564)

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration.

Table 2. Characteristics of Medicare Beneficiaries Receiving Transplants, According to Type of Donor, 1985.*

CHARACTERISTIC	TRANSPLANTS FROM CADAVERS	TRANSPLANTS FROM LIVING RELATED DONORS	ALL TRANSPLANTS†
	no. (%)	no. (%)	no. (% living related)
Age (yr)			
0-14	187 (4)	168 (10)	360 (47)
15-24	590 (12)	327 (20)	936 (35)
25-34	1182 (23)	537 (32)	1771 (30)
35-44	1435 (28)	348 (21)	1830 (19)
45-54	1102 (22)	208 (13)	1339 (16)
55-64	534 (11)	63 (4)	617 (10)
65-74	50 (1)	3 (0)	53 (6)
≥75	4 (0)	0 (0)	4 (0)
Mean age	38.8	31.5	37.0
Sex			
Male	3245 (64)	969 (59)	4321 (22)
Female	1839 (36)	685 (41)	2589 (26)
Race			
White	3666 (72)	1387 (84)	5180 (27)
Black	1197 (24)	206 (12)	1437 (14)
Other or unknown	221 (4)	61 (4)	293 (21)
Primary disease			
Diabetes	912 (18)	320 (19)	1268 (25)
Glomerulonephritis	1605 (32)	572 (35)	2235 (26)
Hypertension	684 (13)	125 (8)	832 (15)
Other or unknown	1882 (37)	637 (39)	2575 (37)
Total	5084 (100)	1654 (100)	6910 (24)

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration.

†Includes transplants in which the type of donor was unspecified.

average, than the recipients of kidneys from living related donors (38.8 vs. 31.5 years). This difference is also evident in the percentage of transplants from living related donors within each age group. Almost half (47 percent) of transplant recipients up to the age of 14 received a kidney from a living related donor. This percentage declined with age, to 6 percent among recipients 65 to 74 years of age. Blacks accounted for 21 percent of patients who received transplants (1437 of 6910), a percentage considerably lower than their 33 percent share of all patients with end-stage renal disease.²⁰ This is consistent with previous findings of differences in access to transplantation according to race.^{21,22} Blacks accounted for 24 percent of the recipients of kidneys from cadavers but only 12 percent of recipients of transplants from living related donors. No striking relation was found between the type of donor and the patient's sex or the primary cause of renal failure.

Trends in New Enrollment

The numbers of patients entering the Medicare end-stage renal disease program are shown in Table 3. The number of newly treated patients with end-stage renal disease continues to rise each year, continuing a trend observed since the program's inception.¹⁰ The total number of patients entering the program increased from 15,195 in 1978 to 28,944 in 1985 — an annual increase of 9.6 percent. There has been little change in these new enrollees in terms of sex and race. In 1978, 56 percent of the new enrollees were male, as were 55 percent in 1985. Whites

made up 69 percent of the new enrollees in 1978 and 68 percent in 1985.

The big change has been in the ages of the patients becoming eligible for program coverage. Twenty-four percent of the new enrollees were 65 or older in 1978 (3665 of 15,195); by 1985 this figure had increased to 36 percent (10,285 of 28,944). Even the number of younger persons newly enrolled in the program has continued to increase, probably because the criteria for initiating treatment, particularly for diabetic patients, have been expanded.

The most important reported causes of renal failure in 1985 were diabetes (n = 8019), hypertension (n = 7097), and glomerulonephritis (n = 6126). Together, these three conditions accounted for 73 percent of the patients newly treated under the Medicare end-stage renal disease program in 1985.

At the same time as more patients have become eligible for Medicare benefits, others have had their Medicare coverage terminated because they have received functioning grafts. The end-stage renal disease program amendments of 1978 specified that patients whose entitlement to Medicare coverage is due only to renal failure (that is, who are not 65 years of age or otherwise disabled) retain benefits for three years after receiving a transplant, unless the graft fails. If the transplantation is successful, Medicare benefits are automatically terminated after three years. Because many persons receiving transplants qualify for Medicare disability coverage, they retain Medicare benefits unless the Social Security Administration rules that they are no longer disabled. Thus, only about half the

Table 3. Characteristics of New Enrollees in the Medicare End-Stage Renal Disease Program, 1978, 1982, and 1985.*

CHARACTERISTIC	YEAR			AVERAGE ANNUAL CHANGE, 1978-1985
	1978	1982	1985	%
	number			
Age (yr)				
0-14	333	414	423	3.5
15-24	1,115	1,170	1,183	0.8
25-34	1,758	2,458	2,684	6.2
35-44	2,045	2,595	3,360	7.4
45-54	2,836	3,529	4,191	5.7
55-64	3,443	5,263	6,818	10.3
65-74	2,848	4,574	6,828	13.3
≥75	817	1,812	3,457	22.9
Mean age	50.9	53.3	55.5	1.2
Sex				
Male	8,515	12,070	15,814	9.2
Female	6,680	9,745	13,130	10.1
Race				
White	10,453	15,163	19,809	9.6
Black	3,879	5,932	8,091	11.1
Other or unknown	863	720	1,044	2.8
Primary disease				
Diabetes	1,412	4,989	8,019	28.2
Glomerulonephritis	1,850	5,093	6,126	18.7
Hypertension	1,792	5,368	7,097	21.7
Other or unknown	10,141	6,365	7,702	-3.9
Total	15,195	21,815	28,944	9.6

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration.

patients with functioning grafts actually lose Medicare coverage at the end of three years. The number of terminations because of successful grafts has increased in recent years, from 258 in 1978 to 1241 in 1985, as a direct result of the increase in both the number of transplantations and the survival rate of grafts. This trend is likely to continue in the near future. Because of the three-year lag between a transplantation and the termination of Medicare coverage, the effects of the larger number of transplantations and the improved outcomes in 1982 through 1985 will not be fully evident until 1988. Nevertheless, these data show that increases in transplantations and improved survival of grafts lead to a slower rate of increase in total program enrollment.

Trends in Total Program Enrollment

Table 4 shows the total enrollment of the Medicare end-stage renal disease program for 1978, 1982, and 1985, including both patients on dialysis and those with functioning grafts. From 1978 to 1985, the number of enrolled patients on dialysis grew at an annual rate of 11.2 percent, whereas the number with functioning grafts grew at an annual rate of 20.6 percent. Consequently, patients with functioning grafts have increased from 11 percent of the total program enrollment in 1978 (5289 of 47,513) to 18 percent in 1985 (19,610 of 108,120). In 1985, the number of patients with functioning grafts continued to grow at a rate of more than 20 percent, whereas the number of patients on dialysis increased by only 6.5 percent. The group of patients with functioning grafts is made up largely of

persons still within the three-year period of eligibility after transplantation. Of the 19,610 patients who had functioning grafts in 1985, 71 percent had undergone transplantation between 1983 and 1985.

The effect of transplantation on the increase in the number of enrollees on dialysis is most evident when different age groups are examined. For all patients under the age of 55, the annual rate of increase between 1978 and 1985 was less than 10 percent. For each age group over 55, the rate of increase was more than 10 percent, with a high of 26.1 percent for those 75 and over. Not only were the rates of growth lower in the younger groups, but among patients 0 to 14 years old and 15 to 24 years old, the number on dialysis actually started to decline. For patients 0 to 14 years of age, the number on dialysis peaked in 1983 and declined in both 1984 and 1985. For patients 15 to 24 years of age, peak enrollment was in 1982, followed by three consecutive years of decline. Furthermore, for patients 25 to 34 years old, the rate of increase in 1985 was only 2.0 percent (as compared with an average annual increase of 7.6 percent over the entire period), suggesting that the proportion of patients on dialysis in this age group may level off and may soon begin to decrease.

The effect of the lower rate of transplantation (as well as higher incidence rates) among blacks than among whites can also be seen in Table 4. From 1978 to 1985, the number of blacks on dialysis grew at an annual rate of 13.6 percent, as compared with 10.2 percent for whites. In 1978, blacks accounted for 28 percent of all patients on dialysis. By 1985 this figure had increased to 33 percent.

The pattern of transplantation among patients with end-stage renal disease in the United States is similar to that shown in data on the European countries from the European Dialysis and Transplantation Association (EDTA)²³ (Table 5). Also shown are data from the registries of Australia and New Zealand and of Canada.^{24,25} In 1985, the EDTA reported 105,421 patients with end-stage renal disease, of whom 25,014 (24 percent) had functioning grafts. The corresponding figures for the U.S. Medicare program were 108,120 enrollees with end-stage renal disease and 19,610 (18 percent) with functioning grafts. Missing from the count of enrollees in the Medicare end-stage renal disease program, however, were over 6000 persons who left the Medicare program with functioning grafts from 1978 through 1985. If they are added to the U.S. total (assuming they are all still living), then the

Table 4. Characteristics of Patients on Dialysis and with Functioning Grafts Enrolled in the Medicare End-Stage Renal Disease Program, 1978, 1982, and 1985.*

CHARACTERISTIC	PATIENTS ON DIALYSIS				PATIENTS WITH FUNCTIONING GRAFTS			
	1978	1982	1985	% ANNUAL CHANGE, 1978-1985	1978	1982	1985	% ANNUAL CHANGE, 1978-1985
Age (yr)								
0-14	476	792	756	6.8	236	349	664	15.9
15-24	2,664	3,362	3,113	2.3	892	1,490	2,162	13.5
25-34	5,025	7,735	8,373	7.6	1,462	3,174	5,276	20.1
35-44	6,248	9,376	11,670	9.3	1,256	2,790	5,424	23.2
45-54	8,819	12,623	14,686	7.6	1,011	2,000	3,764	20.7
55-64	10,466	17,727	22,141	11.3	397	946	2,022	26.2
65-74	6,897	13,465	19,495	16.0	33	110	290	36.4
≥75	1,629	4,500	8,276	26.1	2	3	8	21.9
Mean age	50.7	53.0	55.0	1.2	36.1	37.1	38.3	0.9
Sex								
Male	23,491	37,731	47,102	10.4	3,153	6,777	12,358	21.5
Female	18,733	31,849	41,408	12.0	2,136	4,085	7,252	19.1
Race								
White	28,144	44,948	55,438	10.2	4,219	8,523	15,325	20.2
Black	11,822	21,096	28,890	13.6	810	1,767	3,585	23.7
Other or unknown	2,258	3,536	4,182	9.2	260	572	700	15.2
Primary disease								
Diabetes	2,648	8,562	15,811	29.1	333	1,086	2,910	36.2
Glomerulonephritis	6,646	13,137	19,173	16.3	1,280	2,896	6,100	25.0
Hypertension	4,653	12,062	18,977	22.2	297	833	1,983	31.2
Other or unknown	28,277	35,819	34,549	2.9	3,379	6,047	8,617	14.3
Total	42,224	69,580	88,510	11.2	5,289	10,862	19,610	20.6

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration.

Table 5. Rates of Transplantation in Selected Countries, 1985.*

COUNTRY	NO. OF PATIENTS WITH ESRD				NATIONAL POPULATION (1000s)	PREVALENCE (PATIENTS/MILLION POPULATION)		
	ON DIALYSIS	WITH GRAFT	TOTAL	% WITH GRAFTS		ON DIALYSIS	WITH GRAFT	TOTAL
Austria	1,400	411	1,811	23	7,527	186	55	241
Belgium	2,500	777	3,277	24	9,856	254	79	332
Bulgaria	934	23	957	2	8,960	104	3	107
Czechoslovakia	887	316	1,203	26	15,464	57	20	78
Denmark	753	217	970	22	5,110	147	42	190
Federal Republic of Germany	15,610	3,028	18,638	16	61,205	255	49	305
Finland	455	785	1,240	63	4,902	93	160	253
France	13,081	2,964	16,045	18	55,089	237	54	291
German Democratic Republic	1,689	588	2,277	26	16,701	101	35	136
Greece	1,384	136	1,520	9	9,888	140	14	154
Hungary	496	161	657	25	10,692	46	15	61
Iceland	16	0	16	0	240	67	0	67
Ireland	302	329	631	52	3,533	85	93	179
Israel	1,189	286	1,475	19	4,172	285	69	354
Italy	13,787	1,347	15,134	9	57,033	242	24	265
Luxembourg	88	13	101	13	365	241	36	277
Netherlands	2,465	1,694	4,159	41	14,411	171	118	289
Norway	232	709	941	75	4,151	56	171	227
Poland	1,120	384	1,504	26	36,918	30	10	41
Portugal	1,827	187	2,014	9	10,202	179	18	197
Spain	8,265	2,098	10,363	20	38,523	215	54	269
Sweden	1,151	1,506	2,657	57	8,337	138	181	319
Switzerland	1,461	1,057	2,518	42	6,572	222	161	383
United Kingdom	6,381	5,773	12,154	47	56,327	113	102	216
Yugoslavia	2,934	225	3,159	7	22,955	128	10	138
Total	80,407	25,014	105,421	24	469,133	171	53	225
Australia	2,174	2,164	4,338	50	15,940	138	137	294
New Zealand	398	417	815	51	3,250	122	128	251
Canada	4,462	4,174	8,636	48	25,310	176	165	341
United States								
Medicare only†	88,510	19,610	108,120	18	237,000	373	83	456
Total‡	88,510	25,691	112,641	22	237,000	373	108	475

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration; the European Dialysis and Transplantation Association²⁵; Disney²⁶; and the Canadian Renal Failure Register.²⁷ ESRD denotes end-stage renal disease. EDTA denotes European Dialysis and Transplantation.

†Includes only persons currently enrolled in Medicare.

‡Includes persons currently enrolled in Medicare as well as 6081 with functioning grafts who lost Medicare coverage from 1978 through 1985.

United States has a success rate for transplantations (22 percent) more closely approximating that of the EDTA. (The figures for the United States are not strictly comparable to those for other countries because 6 percent of the total end-stage renal disease population are not included in the Medicare program.)

The rate of transplantation in the United States is more impressive when compared with the overall enrollment of the end-stage renal disease program. The United States has 450 Medicare-program enrollees with end-stage renal disease per million population, a rate greater than that of any of the nations included in the EDTA, although several of those countries (Belgium, the Federal Republic of Germany, Israel, Sweden, and Switzerland), as well as Canada, have rates exceeding 300 per million population. Thus, although the United States has about as many patients with end-stage renal disease as the EDTA countries combined, the overall population from which to draw transplantable organs is only about half as large (237 million vs. 469 million). The EDTA countries combined have 53 patients with functioning grafts per million population, whereas the United States has 83 per million population (a figure 57 percent higher), or 108

per million counting persons whose Medicare entitlement has been terminated. Five countries in Europe (Finland, the Netherlands, Norway, Sweden, and Switzerland), as well as Australia, New Zealand, and Canada, have more than 108 patients with functioning grafts per million population.

Trends in Program Costs

Table 6 shows estimated expenditures for the Medicare end-stage renal disease program for 1974 through 1985. In the early years of the program, expenditures grew quite rapidly (58 percent annual increase in 1975 and 42 percent in 1976), as a result of a rapid rise in program enrollment. From 1977 through 1980, program expenditures grew at about 25 percent per year. More recently, the rate of increase has declined markedly; aggregate expenditures grew at only 4.5 percent in 1984 and 5.3 percent in 1985, despite increases in enrollment of 9.9 and 8.9 percent.

The growth in program expenditures is due to a number of variables. For instance, 41 percent of total Medicare expenditures pays for inpatient hospital stays.¹ From 1974 to 1983, inflation in hospital costs was much higher than increases in the overall Medical Price Index. At the same time, the costs of dialysis

Table 6. Medicare Payments for Persons with End-Stage Renal Disease, 1974 through 1985.*

YEAR	PAYMENTS (MILLIONS OF DOLLARS)	% CHANGE
1974	240	—
1975	380	58.3
1976	540	42.1
1977	670	24.1
1978	840	25.4
1979	1060	26.2
1980	1310	23.6
1981	1540	17.6
1982	1740	13.0
1983	1990	14.4
1984	2080	4.5
1985	2190	5.3

*Data are from the end-stage renal disease program management and medical-information system, Bureau of Data Management and Strategy, Health Care Financing Administration. Payments were adjusted to reflect ratios of cost to charges specifically for end-stage renal disease during inpatient hospital stays (1974 to 1983). Data for 1984 and 1985 were adjusted to reflect the amounts of capital, medical-education, and kidney-acquisition costs passed through to inpatient hospital costs, as well as lags in data for 1985 costs. Medicare payments include expenditures for all services received that were covered by Medicare, not just those for services related to renal disease.

were controlled by the fixed rate Medicare used for payment. Thus, expenditures for inpatient services increased in relation to expenditures for outpatient dialysis. In 1984, Medicare implemented its prospective payment system, which should exert a downward pressure on inpatient expenditures. Expenditures for outpatient dialysis grew by only 1.4 percent in 1984 because of the implementation of the composite-rate reimbursement method, which decreased payments for dialysis by about \$10 per session, and the very slow growth of the number of patients on dialysis (Table 4).

Historically, the most important cause of increasing program expenditures has been increases in the number of patients with end-stage renal disease. A previous study showed that 76 percent of the total increase in Medicare expenditures for patients with end-stage renal disease was due to increased enrollment; only 24 percent was due to increases in per capita costs.²⁶ In the 1980s, much of the slowdown in the growth of program expenditures has resulted from a decrease in the rate of growth of the number of patients with end-stage renal disease.

However, the composition of the group of patients with end-stage renal disease has also contributed to decreases in the rate of growth of program expenditures. Persons on dialysis cost roughly three times as much to treat as those with functioning grafts. Despite the high initial costs of transplantation, the lower costs of maintaining patients with functioning grafts mean that the costs of transplantation, including costs for patients with failed transplants who return to dialysis, are paid back in about three years.¹⁸ Three years after transplantation, the patients with transplants represent a net savings to the Medicare program.

Thus, the rate of growth of expenditures will continue to decline as long as patients with functioning grafts continue to increase as a percentage of total program enrollment.

CONCLUSIONS

The costs of the Medicare end-stage renal disease program will continue to be affected by such factors as inflation, reimbursement methods and coverage, and technological changes. For example, recent studies of the use of human recombinant erythropoietin for the treatment of anemia in patients on dialysis suggest that this drug can restore normal hematocrit values, eliminate the need for routine blood transfusions, and improve the quality of life for patients on dialysis.^{27,28} The effect of erythropoietin on costs is difficult to estimate. On the one hand, this drug is likely to be a costly addition to routine dialysis. On the other hand, if erythropoietin improves the health of patients, it could lead to savings through reduced need for blood transfusions and perhaps fewer hospitalizations. The rapid spread in the use of continuous ambulatory peritoneal dialysis could have affected program expenditures, but most patients who are at home have elected to be covered under the current composite-rate method, so there is little difference in payments among different methods of dialysis. The coverage of immunosuppressive drugs, called for in the Omnibus Budget Reconciliation Act of 1986, is an example of a change in coverage that will increase program expenditures.

On the whole, however, transplantation will have the effect of slowing the rate of increase of overall costs. Maintaining patients with functioning grafts is roughly one third as expensive as care for patients on dialysis. Therefore, as the distribution of the patients enrolled in the Medicare end-stage renal disease program continues to shift toward a greater proportion of patients with functioning grafts, expenditures will be proportionately moderated.

The data presented in this paper illuminate a heretofore unexamined aspect of the Medicare end-stage renal disease program. The combined effect of increasing numbers of transplantations and increased survival rates of grafts is resulting in a shift from what was primarily a population of patients on dialysis to a population increasingly composed of patients with functioning grafts. This is particularly true of persons younger than 55. By the end of 1985, 31 percent of enrollees in the Medicare end-stage renal disease program in this age group had functioning grafts. Among patients younger than 25, the number of patients on dialysis has already begun to decline.

Along with the decrease in the proportion of younger patients on dialysis, there has also been a slight shift toward transplantation among older patients. Therefore, it is likely that transplantation will begin to have a larger effect on patients from 25 to 54 years old, particularly if the number of transplantations continues to increase at the current rate.

This is not to suggest that the Medicare end-stage renal disease program is close to becoming a nondialysis program. The total number of patients on dialysis continues to grow. Among patients in the fastest-growing group of enrollees, those over age 65, transplantation has had little effect and treatment patterns show no signs of changing. In 1985 there were 10,285 new patients with end-stage renal disease in this age group; in the same year, 57 persons aged 65 or over received a transplant. It thus appears that the Medicare end-stage renal disease program is increasingly covering a divided population: those under 55 years old, who are increasingly likely to receive transplants, and those aged 55 and older, who are almost all on dialysis.

The trends in transplantation have not yet had much effect on black beneficiaries, who constitute about 30 percent of the patients with end-stage renal disease. Through 1985, black Medicare beneficiaries with end-stage renal disease were receiving transplants at only half the rate of white beneficiaries; 11 percent of black patients had functioning grafts, as compared with 22 percent of white patients. However, the trend among blacks is in the same direction as that among whites. Each year a higher percentage of the black population with end-stage renal disease has functioning grafts. As increasing numbers of transplantations are performed, and as the number of younger patients on dialysis decreases, it is likely that more transplantations will be performed both on older white patients and on black patients generally, thereby decreasing the differences between age and racial groups.

In terms of the Medicare end-stage renal disease program, these are encouraging signs. The total enrollment of the Medicare program is beginning to level off. In addition, the fastest-growing group of beneficiaries are those with functioning grafts. Thus, the best clinical outcome for the patients is converging with the best outcome in terms of program expenditures.

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Survival analyses

Program experience with respect to both patient and graft survival from onset of renal failure or from date of kidney transplant to 3 years subsequent is discussed in this section. This analysis covers the period from January 1, 1983 through January 31, 1986. All Medicare beneficiaries with renal failure occurring on or after January 1, 1983 through December 31, 1986 were included in the analysis of dialysis survival. The transplant survival analysis included Medicare beneficiaries whose transplants occurred on or after January 1, 1983 through December 31, 1986. The total number of persons included in the computation of dialysis patient survival was 111,069. The total number of transplants included in the computation of transplant survival was 27,171 (20,526 cadaver donor transplants and 6,645 living-related donor transplants).

Data

Computation of survival rates for dialysis patients requires a date of renal failure onset, date of death, and date of transplant (if the patient was subsequently transplanted). Computation of survival rates for transplantation, both patient survival and graft survival, requires the date of transplantation, date of graft failure, and date of death. Dates of death were taken from the Master Beneficiary Records that are maintained for all Medicare beneficiaries. The determination of renal failure onset was defined as the date of first dialysis and was taken from the patient medical evidence record (HCFA-2728) or the outpatient dialysis record (HCFA-1483 or HCFA-1450), or was estimated from the entitlement records. The date of transplant was taken from the transplant form (HCFA-2745) or from the inpatient hospital bill (HCFA-1453 or HCFA-1450). The date of transplant failure was taken from the transplant follow-up form, or was calculated based on a record of outpatient dialysis sessions, or was based on a date of retransplantation.

Survival rates were calculated using a standard actuarial modified life-table analysis. For dialysis patients, survival was measured from date of renal failure onset until death with right censoring¹ for transplantation or the end of the observation period (December 31, 1987). For transplants, patient survival was measured from date of transplantation until death with right censoring for the end of the observation period. Graft survival for transplants was measured from date of transplantation until graft failure date or date of death with right censoring for the end of the observation period.

Because there are significant age differences among the population subgroups (for instance, white persons

on dialysis are older than black persons on dialysis and persons whose renal failure is caused by hypertension are older than persons whose renal failure is caused by diabetes), the survival rates for each sex, race, and primary diagnostic subgroup were age-adjusted to the age distribution for all persons in each table. For example, survival for males and females on dialysis were age-adjusted to the age distribution for all persons on dialysis. Individual survival rates among cadaver donor transplants were age-adjusted to all cadaver donor transplants and individual survival rates among living-related donor transplants were age-adjusted to all living-related donor transplants. Therefore, survival differences among population subgroups because of age differences were largely eliminated.

Results

The results of the analysis of dialysis patient survival are presented in Table 31. At 1 year following renal failure onset, 78.0 percent of patients were still alive. At 2 years, this had decreased to 62.8 percent and at 3 years to 51.2 percent. There were notable differences by age group. Persons under 25 years of age (at the time of renal failure) had a 1-year survival rate of 95 percent and a 3-year survival rate of over 85 percent. The rate of survival decreased for each older age cohort. For those 75 years of age or over, the 1-year survival rate was only 57.4 percent and less than one-quarter (22.7 percent) could be expected to survive 3 years. At 3 years, females have a 3.2 percent higher cumulative survival rate than do males (52.9 percent and 49.7 percent, respectively).

Among racial groups the highest survival is found among black persons (82.9 percent at 1 year and 57.9 percent at 3 years). Asian persons and American Indians have survival rates slightly below that of black persons. The lowest survival on dialysis is found among white persons with a survival rate of 76.7 percent at 1 year and 49.2 percent at 3 years.

By reported cause of renal failure, the lowest survival rates are for those whose renal failure was attributed to diabetes (38.6 percent at 3 years) and hypertension (56.1 percent at 3 years). Persons whose renal failure is attributed to glomerulonephritis have a 3-year survival rate of 60.8 percent and persons whose renal failure is attributed to polycystic kidney disease have a 3-year survival rate of 71.2 percent.

Patient survival rates for persons with cadaver donor transplants and living-related donor transplants are presented in Tables 32 and 33, respectively. Among cadaver donor transplant recipients, 1-, 2-, and 3-year patient survival rates are 91.0 percent, 86.9 percent, and 82.5 percent, respectively. Patient survival decreases with advancing age, with 3-year survival rates of about 90 percent for persons less than 25 years old, falling to 64.7 percent for persons ages 65-74. Females had 3-year survival rates about 2 percent greater than males

¹ Right censoring is a technique for handling cases in which the person is still alive at the end of the observation period. The life table calculation stops at the right censor date for these persons. However, unlike a withdrawal because of death, there is no increment to the number of deaths.

Table 31
Dialysis patient survival, by age, sex, race, and primary disease: 1983-86

Age, sex, race, and primary disease	Total	Percent surviving		
		1 year	2 years	3 years
All persons	111,069	78.0 (0.1)	62.8 (0.2)	51.2 (0.2)
Age				
Under 15 years	1,653	95.0 (0.6)	91.1 (1.0)	89.3 (1.2)
15 - 24 years	4,580	95.0 (0.4)	90.0 (0.6)	85.7 (1.1)
25 - 34 years	10,659	91.4 (0.3)	82.0 (0.5)	73.2 (0.7)
35 - 44 years	12,736	89.7 (0.3)	78.4 (0.4)	69.4 (0.6)
45 - 54 years	16,097	86.5 (0.3)	73.0 (0.4)	61.0 (0.5)
55 - 64 years	25,707	79.1 (0.3)	62.9 (0.3)	49.9 (0.4)
65 - 74 years	26,369	66.8 (0.3)	47.9 (0.3)	34.8 (0.3)
75 years or over	13,268	57.4 (0.4)	36.5 (0.4)	22.7 (0.4)
Sex				
Male	61,081	77.1 (0.2)	61.4 (0.2)	49.7 (0.3)
Female	49,988	78.9 (0.2)	64.4 (0.2)	52.9 (0.3)
Race				
White	69,635	76.7 (0.2)	60.9 (0.2)	49.2 (0.2)
Black	28,545	82.9 (0.2)	69.6 (0.3)	57.9 (0.4)
Asian	1,666	83.6 (0.9)	67.9 (1.3)	55.1 (1.6)
American Indian	1,104	82.3 (1.2)	66.3 (1.6)	54.4 (1.9)
Other/unknown	10,119	71.9 (0.5)	56.0 (0.5)	44.2 (0.6)
Primary disease				
Diabetes	30,049	73.2 (0.3)	53.1 (0.3)	38.6 (0.4)
Hypertension	26,739	80.2 (0.3)	67.0 (0.3)	56.1 (0.4)
Glomerulonephritis	23,504	83.5 (0.2)	71.1 (0.3)	60.8 (0.4)
Polycystic kidney disease	3,541	90.0 (0.4)	80.9 (0.6)	71.2 (0.9)
Other	11,600	74.6 (0.4)	60.6 (0.5)	50.7 (0.6)
Unknown	14,742	74.5 (0.4)	59.9 (0.5)	48.9 (0.5)

NOTES: Numbers in parentheses represent the standard error of the estimate for each value. Rates based on fewer than 30 observations are not displayed. Survival rates for individual sex, race, and primary disease groups were age-adjusted to the age distribution of all dialysis patients.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1983-86.

(83.9 percent and 81.7 percent, respectively). White persons, black persons, and Asian persons all had 3-year survival rates of over 80 percent. Patient survival was lower among American Indians at 78.8 percent. Persons whose renal failure was attributed to glomerulonephritis had the highest 3-year survival rate at 87.3 percent, and persons with diabetes had the lowest 3-year survival rate at 72.6 percent.

Among living-related donor transplant recipients, 1-, 2-, and 3-year patient survival rates were 96.4 percent, 94.6 percent, and 92.1 percent, respectively. Three-year patient survival rates ranged from a high of 96.2 percent for persons ages 15-24 to 84.3 percent for persons ages 45-54. Males had slightly higher 3-year survival rates than did females (92.5 percent and 91.6 percent, respectively). Asian persons had the highest 3-year survival rate of 94.6 percent, followed by white persons (92.6 percent), black persons (89.4 percent), and American Indians (87.9 percent). By cause of renal failure, persons whose renal failure was attributed to polycystic kidney disease had 3-year survival rates over 97 percent. Survival for persons with glomerulonephritis, hypertension, and diabetes was

94.5 percent, 91.5 percent, and 84.9 percent, respectively.

Kidney graft survival rates for persons with cadaver donor transplants and living-related donor transplants are presented in Tables 34-35, respectively. Among cadaver kidney recipients, 71.0 percent of the kidney grafts survived for at least 1 year. At 2 years, 64.0 percent still survived and at 3 years, just under three-fifths (57.7 percent) were still functioning. There was little difference in graft survival across age and sex groups with almost all groups having 3-year survival rates of between 55-60 percent. Asian and white cadaver donor transplant recipients had 3-year graft survival rates of 66.5 percent and 60.2 percent, respectively. Lower graft survival rates were experienced by black recipients (49.5 percent), and American Indian recipients (51.8 percent). There were also differences in graft survival by primary disease category with persons with glomerulonephritis (60.2 percent) and polycystic kidney disease (61.1 percent) having higher 3-year survival rates than persons with hypertension (52.6 percent) and diabetes (54.9 percent).

Among persons receiving a transplant from a living-related donor, 1-, 2-, and 3-year graft survival rates were 87.8 percent, 83.4 percent and 79.0 percent, respectively. By age, 3-year survival rates ranged from a high of 82.6 percent for persons ages 25-34 to a low of 73.4 percent for persons ages 45-54. Males had a slightly higher survival rate (79.2 percent) than did females (78.5 percent). Differences by race group were

quite high, ranging from a high of 84.7 percent among Asian persons to a low of 64.6 percent among black persons. By primary disease category, 3-year graft survival rates were highest for persons whose renal failure was attributed to polycystic kidney disease (82.7 percent) or glomerulonephritis (79.9 percent) and lowest for persons whose renal failure was attributed to either hypertension (73.8 percent) or diabetes (72.8 percent).

Table 32
Cadaver donor transplant patient survival, by age, sex, race, and primary disease: 1983-86

Age, sex, race, and primary disease	Total	Percent surviving		
		1 year	2 years	3 years
All persons	20,526	91.0 (0.2)	86.9 (0.2)	82.5 (0.3)
Age				
Under 15 years	739	93.6 (0.9)	91.2 (1.1)	88.0 (1.3)
15-24 years	2,351	95.4 (0.4)	92.9 (0.6)	90.9 (0.7)
25-34 years	5,125	93.7 (0.3)	90.0 (0.4)	86.4 (0.5)
35-44 years	5,646	91.2 (0.4)	87.3 (0.5)	82.1 (0.6)
45-54 years	4,326	88.2 (0.5)	83.2 (0.6)	78.6 (0.7)
55-64	2,111	84.9 (0.8)	79.0 (0.9)	72.7 (1.1)
65-74	220	80.5 (2.7)	72.7 (3.2)	64.7 (4.0)
75 years or over	8	—	—	—
Sex				
Male	12,996	91.2 (0.3)	86.5 (0.3)	81.7 (0.4)
Female	7,530	91.2 (0.3)	87.6 (0.4)	83.9 (0.5)
Race				
White	15,112	91.1 (0.2)	87.1 (0.3)	82.7 (0.4)
Black	4,782	91.2 (0.4)	86.1 (0.5)	81.7 (0.6)
Asian	381	91.2 (1.5)	86.1 (1.8)	84.0 (2.0)
American Indian	176	92.9 (2.0)	85.4 (2.9)	78.8 (3.6)
Other/unknown	75	91.4 (2.6)	86.2 (3.3)	81.4 (4.7)
Primary disease				
Diabetes	3,551	86.9 (0.6)	79.7 (0.7)	72.6 (0.9)
Hypertension	2,686	91.9 (0.6)	87.4 (0.7)	83.1 (0.9)
Glomerulonephritis	6,499	93.7 (0.3)	90.6 (0.4)	87.3 (0.5)
Polycystic kidney disease	1,500	92.2 (0.8)	89.4 (0.9)	86.6 (1.1)
Other	2,369	91.7 (0.5)	88.3 (0.7)	83.2 (0.8)
Unknown	3,921	90.4 (0.5)	86.1 (0.6)	81.9 (0.7)

NOTES: Numbers in parentheses represent the standard error of the estimate for each value. Rates based on fewer than 30 observations are not displayed. Survival rates for individual sex, race, and primary disease groups were age-adjusted to the age distribution of all cadaver donor transplant recipients.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1983-86.

Table 33

Living-related donor transplant patient survival, by age, sex, race, and primary disease: 1983-86

Age, sex, race, and primary disease	Total	Percent surviving		
		1 year	2 years	3 years
All persons	6,645	96.4 (0.2)	94.6 (0.3)	92.1 (0.4)
Age				
Under 15 years	683	97.5 (0.6)	96.4 (0.7)	94.7 (0.9)
15-24 years	1,411	98.2 (0.4)	97.4 (0.4)	96.2 (0.6)
25-34 years	2,187	97.3 (0.4)	95.9 (0.4)	93.8 (0.6)
35-44 years	1,326	95.3 (0.6)	92.7 (0.7)	89.8 (0.9)
45-54 years	771	93.1 (0.9)	89.6 (1.4)	84.3 (1.5)
55-64 years	252	92.5 (1.7)	88.7 (2.1)	84.4 (2.6)
65-74 years	13	—	—	—
75 years or over	2	—	—	—
Sex				
Male	4,008	96.6 (0.3)	94.9 (0.4)	92.5 (0.5)
Female	2,637	96.1 (0.4)	94.2 (0.5)	91.6 (0.6)
Race				
White	5,649	96.7 (0.2)	95.1 (0.3)	92.6 (0.4)
Black	813	94.6 (0.8)	92.1 (1.0)	89.4 (1.2)
Asian	94	99.3 (1.1)	94.6 (2.3)	94.6 (2.3)
American Indian	74	93.2 (2.9)	91.7 (3.2)	87.9 (4.3)
Other/unknown	15	—	—	—
Primary disease				
Diabetes	1,271	92.6 (0.7)	89.7 (0.9)	84.9 (1.2)
Hypertension	495	96.6 (1.0)	94.0 (1.3)	91.5 (1.6)
Glomerulonephritis	2,365	97.5 (0.3)	96.3 (0.4)	94.5 (0.5)
Polycystic kidney disease	252	98.8 (1.0)	98.0 (1.2)	97.2 (1.6)
Other	1,116	97.6 (0.4)	96.1 (0.5)	93.0 (0.7)
Unknown	1,146	96.5 (0.5)	94.8 (0.7)	93.6 (0.8)

NOTES: Numbers in parentheses represent the standard error of the estimate for each value. Rates based on fewer than 30 observations are not displayed. Survival rates for individual sex, race, and primary disease groups were age-adjusted to the age distribution of all living-related donor transplant recipients.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1983-86.

Table 34

Cadaver donor transplant graft survival of patients, by age, sex, race, and primary disease: 1983-86

Age, sex, race, and primary disease	Total	Percent surviving		
		1 year	2 years	3 years
All persons	20,526	71.0 (0.3)	64.0 (0.3)	57.7 (0.4)
Age				
Under 15 years	739	62.1 (1.8)	54.7 (1.9)	49.1 (2.0)
15-24 years	2,351	70.1 (0.9)	62.8 (1.0)	56.4 (1.1)
25-34 years	5,125	72.3 (0.6)	64.8 (0.7)	58.3 (0.8)
35-44 years	5,646	71.1 (0.6)	64.2 (0.7)	57.6 (0.7)
45-54 years	4,326	71.1 (0.7)	64.6 (0.8)	58.9 (0.8)
55-64 years	2,111	71.6 (1.0)	65.2 (1.1)	59.0 (1.2)
65-74 years	220	68.6 (3.1)	61.3 (3.4)	57.4 (3.9)
75 years or over	8	-	-	-
Sex				
Male	12,996	71.1 (0.4)	63.5 (0.4)	57.1 (0.5)
Female	7,530	70.8 (0.5)	64.7 (0.6)	58.9 (0.6)
Race				
White	15,112	72.3 (0.4)	66.4 (0.4)	60.2 (0.4)
Black	4,782	66.5 (0.7)	56.2 (0.7)	49.5 (0.8)
Asian	381	75.0 (2.2)	69.8 (2.4)	66.5 (2.6)
American Indian	176	71.8 (3.4)	58.9 (3.9)	51.8 (4.3)
Other/unknown	75	69.1 (5.1)	65.2 (5.4)	62.0 (6.1)
Primary disease				
Diabetes	3,551	69.6 (0.8)	62.0 (0.8)	54.9 (1.0)
Hypertension	2,686	70.8 (0.9)	61.2 (1.0)	52.6 (1.1)
Glomerulonephritis	6,499	72.9 (0.6)	66.5 (0.6)	60.2 (0.7)
Polycystic kidney disease	1,500	71.6 (1.2)	65.6 (1.2)	61.1 (1.4)
Other	2,369	71.1 (0.9)	64.4 (1.0)	57.5 (1.1)
Unknown	3,921	69.6 (0.7)	63.2 (0.8)	58.2 (0.9)

NOTES: Numbers in parentheses represent the standard error of the estimate for each value. Rates based on fewer than 30 observations are not displayed. Survival rates for individual sex, race, and primary disease groups were age-adjusted to the age distribution of all cadaver donor transplant recipients.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1983-86.

Table 35
Living-related donor transplant graft survival of patients, by age,
sex, race, and primary disease: 1983-86

Age, sex race, and primary disease	Total	Percent surviving		
		1 year	2 years	3 years
All persons	6,645	87.8 (0.4)	83.4 (0.5)	79.0 (0.6)
Age				
Under 15 years	683	86.2 (1.3)	80.7 (1.5)	76.0 (1.8)
15 - 24 years	1,411	88.5 (0.9)	83.3 (1.0)	79.5 (1.2)
25 - 34 years	2,187	89.7 (0.7)	86.6 (0.7)	82.6 (0.9)
35 - 44 years	1,326	85.8 (1.0)	82.0 (1.1)	77.8 (1.2)
45 - 54 years	771	86.8 (1.2)	80.1 (1.5)	73.4 (1.8)
55 - 64 years	252	86.5 (2.2)	80.9 (2.6)	75.9 (3.0)
65 - 74 years	13	—	—	—
75 years or over	0	—	—	—
Sex				
Male	4,008	88.0 (0.5)	83.5 (0.6)	79.2 (0.7)
Female	2,637	87.4 (0.6)	83.2 (0.7)	78.5 (0.9)
Race				
White	5,649	88.9 (0.4)	85.2 (0.5)	81.0 (0.6)
Black	813	79.4 (1.4)	70.7 (1.7)	64.6 (1.8)
Asian	94	92.6 (2.7)	86.0 (3.6)	84.7 (3.9)
American Indian	74	88.3 (4.0)	82.7 (4.7)	79.5 (5.4)
Other/unknown	15	—	—	—
Primary disease				
Diabetes	1,271	81.3 (1.0)	77.9 (1.1)	72.8 (1.4)
Hypertension	495	87.3 (1.5)	77.9 (1.9)	73.8 (2.2)
Glomerulonephritis	2,365	88.7 (0.7)	83.9 (0.8)	79.9 (0.9)
Polycystic kidney disease	252	90.8 (2.0)	88.7 (2.2)	82.7 (2.8)
Other	1,116	88.3 (1.0)	85.0 (1.1)	79.4 (1.3)
Unknown	1,146	89.4 (0.9)	86.0 (1.1)	83.6 (1.2)

NOTES: Numbers in parentheses represent the standard error of the estimate for each value. Rates based on fewer than 30 observations are not displayed. Survival rates for individual sex, race, and primary disease groups were age-adjusted to the age distribution of all living-related donor transplant recipients.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1983-86.

Utilization

Medicare inpatient hospital use

In 1986, there were 117,385 Medicare end stage renal disease (ESRD) beneficiaries who were eligible for Medicare benefits for at least part of the year. The analysis that follows considers inpatient utilization separately for each of the patient groups presented.

Persons on dialysis for the entire eligible year

Persons on dialysis for the entire eligible year numbered 87,943 and comprised 74.9 percent of all Medicare ESRD beneficiaries. Distribution of these patients by age with the number of inpatient days and discharges associated with each group is shown in Table 36. This group is older than the total ESRD beneficiary population with 58 percent being 55 years of age or older. This dialysis population was hospitalized 113,293 times and accounted for 1,021,549 days of inpatient care. This utilization resulted in a discharge

rate per 1,000 beneficiaries of 1,288, the days of care rate per 1,000 beneficiaries of 11,616, and an average length of stay per discharge of 9.0 days. There was a direct relationship between age and inpatient use. Compared with persons 0-14 years of age, persons 65 years of age or over were hospitalized 59 percent more often (950 discharges per 1,000 and 1,513 discharges per 1,000, respectively) and spent 71 percent more days as an inpatient (8,699 days per 1,000 and 14,903 per 1,000, respectively). Length of stay was lowest for persons 15-24 years of age (7.3 days per stay) and highest for persons 65 years of age or over (9.9 days per stay).

Persons receiving a transplant in 1986

In 1986, there were 7,541 Medicare beneficiaries who received a kidney transplant. They accounted for 6.4 percent of the entire ESRD Medicare beneficiary population. The utilization of inpatient care by this

Table 36
Discharge rates for Medicare dialysis patients, by days of care rates, average length of stay, and age: 1986

Age	Number of patients	Number of inpatient days	Number of inpatient discharges	Discharges per 1,000 persons	Days per 1,000 persons	Average length of stay
Total	87,943	1,021,549	113,293	1,288	11,616	9.0
Under 15 years	582	5,063	553	950	8,699	9.2
15-24 years	2,634	19,649	2,687	1,020	7,460	7.3
25-34 years	7,912	68,440	8,917	1,127	8,650	7.7
35-44 years	11,607	106,340	12,902	1,112	9,162	8.2
45-54 years	14,273	143,417	16,719	1,171	10,048	8.6
55-64 years	21,959	246,823	27,685	1,261	11,240	8.9
65 years and over	28,976	431,817	43,830	1,513	14,903	9.9

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1986.

Table 37
Discharge rates for Medicare kidney transplant patients, by days of care rates, average length of stay, and age: 1986

Age	Number of patients	Number of inpatient days	Number of inpatient discharges	Discharges per 1,000 persons	Days per 1,000 persons	Average length of stay
Total	7,541	203,610	16,341	2,167	27,000	12.5
Under 15 years	311	7,127	590	1,897	22,916	12.1
15-24 years	936	25,060	2,067	2,208	26,774	12.1
25-34 years	1,944	52,984	4,348	2,237	27,255	12.2
35-44 years	1,953	53,911	4,271	2,187	27,604	12.6
45-54 years	1,497	40,156	3,106	2,075	26,824	12.9
55-64 years	791	21,807	1,733	2,191	27,569	12.6
65 years and over	109	2,565	226	2,073	23,532	11.3

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1986.

population is shown in Table 37. In contrast to the dialysis population, the transplant population is younger, with only 11.9 percent 55 years of age or older. Because of the transplant stay itself and associated inpatient stays both before and after the transplant stay, this population experiences high hospitalization rates. The 7,541 persons in this group had 16,341 hospitalizations and were hospitalized for a total of 203,610 days. This resulted in a discharge rate of 2,167 discharges per 1,000 beneficiaries and a days of care rate of 27,000 days per 1,000 beneficiaries. The lowest discharge and days of care rates were experienced by the youngest age group, persons 0-14 years of age. For the remaining persons there was not much difference in utilization by age group.

Persons receiving a transplant in a year prior to 1986, with a functioning graft throughout 1986

This group of persons represents the successful transplants from previous years. The 20,827 persons in this group accounted for 17.7 percent of all Medicare ESRD beneficiaries in 1986 (up from 16.6 percent in 1985). The inpatient utilization for this patient population is presented in Table 38. The age distribution for this group is similar to that of persons transplanted in 1986. Fifty-six percent of these persons are between the ages 25-44. The utilization of inpatient care is much less for this group than for either dialysis or transplant patients. This group was hospitalized 11,291 times for a total of 94,768 days. This utilization amounts to a discharge rate of 542 per 1,000 beneficiaries and a days of care rate of 4,550 per 1,000 beneficiaries. There was a direct relationship between inpatient use and age.

Persons under 25 years of age had discharge rates of less than 500 per 1,000. Persons between the ages 25-64 had discharge rates of 500 to 600 per 1,000 and persons 65 years of age or over had the highest discharge rate at 670 per 1,000. Total days of care followed a similar pattern with persons 65 years of age or over having 93 percent more hospital days than persons under 15 years of age (5,421 days per 1,000 and 2,806 days per 1,000, respectively).

Persons receiving a transplant in a year prior to 1986, with a kidney graft failure in 1986

The final group of ESRD beneficiaries represents those persons who received a kidney transplant before 1986 and experienced a graft failure in 1986. There were 1,074 of these persons, representing 0.9 percent of the total Medicare ESRD beneficiary population. Presented in Table 39 are the inpatient utilization rates for these persons. As shown in the table, the rejection of a transplant is associated with a high rate of hospitalization. These persons accounted for 2,754 hospitalizations and a total of 26,351 inpatient days. This utilization amounts to a discharge rate of 2,564 discharges per 1,000 beneficiaries and a days of care rate of 24,535 days per 1,000 beneficiaries. There is little relationship between age and utilization in this patient population with most age groups experiencing discharge rates of about 2,500 per 1,000 beneficiaries. However, days of care rates range from a low of 20,839 per 1,000 beneficiaries for persons 15-24 years of age to a high of 27,539 for persons 55-64 years of age.

Table 38
Discharge rates for Medicare functioning kidney graft patients, by days of care rates, average length of stay, and age: 1986

Age	Number of patients	Number of inpatient days	Number of inpatient discharges	Discharges per 1,000 persons	Days per 1,000 persons	Average length of stay
Total	20,827	94,768	11,291	542	4,550	8.4
Under 15 years	674	1,891	308	457	2,806	6.1
15-24 years	2,348	6,849	996	424	2,917	6.9
25-34 years	5,828	24,200	3,012	525	4,219	8.0
35-44 years	5,828	29,257	3,308	568	5,020	8.8
45-54 years	3,911	20,297	2,285	584	5,190	8.9
55-64 years	2,069	10,859	1,207	583	5,248	9.0
65 years and over	261	1,415	175	670	5,421	8.1

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1986.

Table 39
Discharge rates for Medicare kidney graft failure patients, by days of care rates,
average length of stay, and age: 1986

Age	Number of patients	Number of inpatient days	Number of inpatient discharges	Discharges per 1,000 persons	Days per 1,000 persons	Average length of stay
Total	1,074	26,351	2,754	2,564	24,535	9.6
Under 15 years	39	833	87	2,231	21,359	9.6
15-24 years	149	3,105	374	2,510	20,839	8.3
25-34 years	289	6,537	707	2,446	22,619	9.2
35-44 years	305	8,189	833	2,731	26,849	9.8
45-54 years	198	5,128	501	2,530	25,899	10.2
55-64 years	89	2,451	239	2,685	27,539	10.3
65 years and over	5	108	13	2,600	21,600	8.3

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, February 1988 update, 1986.

Providers of renal care

This section discusses the growth in the number of participating renal providers furnishing some form of end stage renal disease (ESRD) treatment. For the purpose of this report, all providers furnishing dialysis are called facilities and all hospitals approved to do transplants are called transplant centers.

Growth in numbers and types of providers

The ESRD program began in 1973. The total number of Medicare-approved renal providers has risen 181 percent, from 606 in 1973 to 1,701 in December 1987 (Figure 1).

The growth in the number of renal dialysis facilities has been primarily among freestanding facilities; i.e., facilities not affiliated with hospitals. In 1973, freestanding facilities represented about one out of nine renal facilities (11.2 percent); hospital units or hospital satellites made up the remaining eight out of nine (88.8 percent). By the end of 1987, more than one of every two renal facilities (56 percent) was freestanding.

Ownership or control

In 1987, more than four out of every ten (47 percent) renal facilities were proprietary and were almost exclusively freestanding (Table 40). Proprietary facilities represent an increasing proportion of all facilities. Nonprofit renal facilities are mainly hospital owned and operated.

Type of renal care provided

In 1987, close to 8,967 renal transplants were performed in 199 renal hospital units called "transplant

centers." (A total of 199 units were actually approved to perform transplants.) All but 39 of these transplant centers also provide outpatient dialysis services (Table 41).

Patients not receiving kidney transplants receive dialysis care either at home or at one of the 1,620 renal facilities providing dialysis services. Of this number, 1,109 are "dialysis facilities," which means they are approved to furnish at least one dialysis service. These facilities may be in either a hospital (149) or nonhospital (960) setting.

Another 511 locations are called "dialysis centers." These are hospital units which, in addition to providing dialysis service(s), are also approved to furnish the full spectrum of diagnostic, therapeutic, and rehabilitative services. Of the total number of dialysis centers, 160 are also transplant centers.

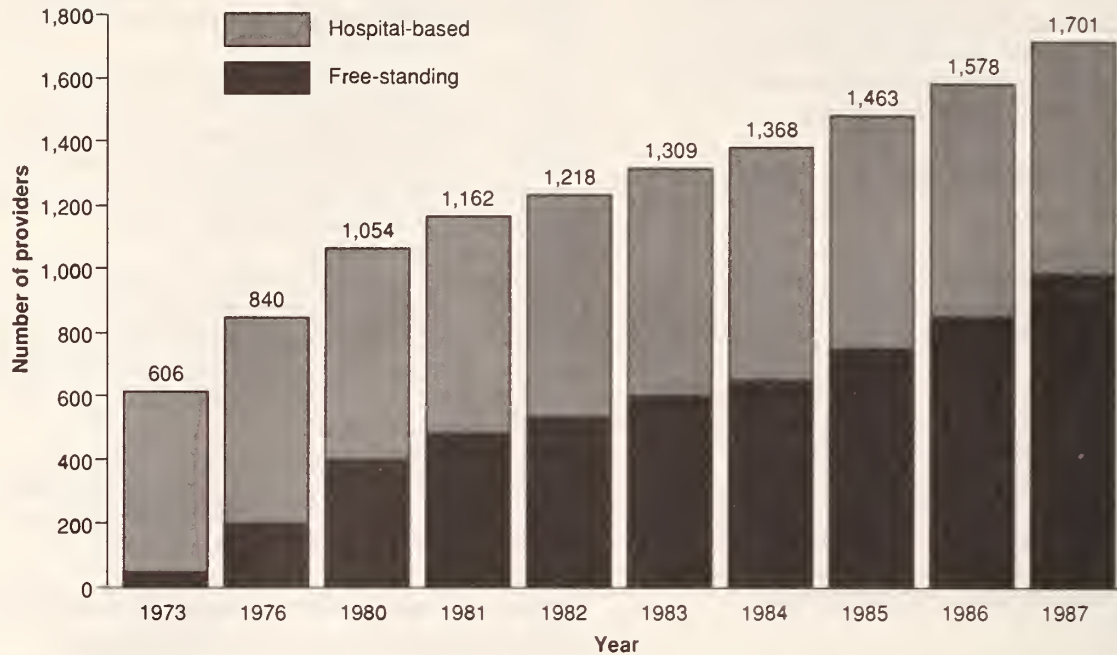
Finally, 42 renal dialysis centers are defined as "inpatient care" centers because they provide backup dialysis services only, and 20 percent or less of their dialysis is performed on an outpatient basis.

Regional and State comparison--renal dialysis facilities and populations

Across the country there is over a threefold variation in the proportion of all facilities that are freestanding, from a low of 29 percent in the New York region (Appendix D regional map) to a high of 84 percent in the Atlanta region. These data are also displayed by State (Table 42).

A dialysis station is a treatment area within a facility, designed and equipped to provide adequate and safe dialysis therapy, as well as privacy and comfort for patients. Those regions such as the Seattle region with low outpatient dialysis stations may have a high home dialysis population.

Figure 1
Number of Medicare end stage renal disease providers, hospital-based versus free-standing:
Selected years, 1973-87



SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, 1973-87.

Table 40
Number and percent of certified end stage renal disease providers, by type of ownership: 1984 - 87

Type of ownership	1984		1985		1986		1987	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Total	1,368	100.0	1,463	100.0	1,578	100.0	1,701	100.0
Proprietary	552	40.4	616	42.1	715	45.3	805	47.3
Hospital-based	23	1.7	26	1.8	24	1.5	24	1.4
Freestanding	529	38.7	590	40.3	691	43.8	781	45.9
Nonprofit	816	59.6	847	57.9	863	54.7	896	52.7
Hospital-based	677	49.4	689	47.1	693	43.9	717	42.2
Freestanding	139	10.2	158	10.0	170	10.8	179	10.5

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, 1984-87.

Table 41
Number of certified end stage renal disease providers of service, type of service, and number of approved dialysis stations, by region: December 1987

Region	Total providers of service ¹	Hospital transplant centers	Outpatient dialysis facilities			Inpatient hospital dialysis centers	Approved dialysis stations	Facilities training in self-dialysis
			Total	Hospital	Freestanding			
All regions	1,701	199	1,620	660	960	42	21,246	1,143
Boston	62	13	60	39	21	0	716	54
New York	152	18	152	108	44	0	2,140	107
Philadelphia	220	22	212	80	132	8	2,796	156
Atlanta	359	25	347	55	292	7	4,960	207
Chicago	232	37	220	147	73	10	2,896	166
Dallas	256	31	239	76	163	4	3,182	153
Kansas City	78	17	68	39	29	7	794	65
Denver	46	6	44	30	14	0	420	31
San Francisco	258	24	244	67	177	5	2,990	181
Seattle	38	6	34	19	15	1	352	23

¹ Categories do not add to total because some hospital transplant centers also provide outpatients services and are counted again in that category.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, December 1987.

Table 42
Number of certified end stage renal disease providers of service and number of approved dialysis stations, by State: December 1987

State	Total providers of service ¹	Hospital transplant centers	Outpatient dialysis facilities			Inpatient hospital dialysis centers	Approved dialysis stations	Facilities training in self-dialysis
			Total	Hospital	Freestanding			
Total	1,701	199	1,620	660	960	42	21,246	1,143
Alabama	34	2	33	2	31	1	431	26
Alaska	3	0	2	0	2	1	12	1
Arizona	32	4	32	13	19	0	297	25
Arkansas	24	2	23	8	15	1	270	20
California	208	19	194	43	151	5	2,508	146
Colorado	15	3	14	8	6	0	184	11
Connecticut	17	2	17	14	3	0	184	17
Delaware	4	0	4	2	2	0	159	3
District of Columbia	17	5	17	8	9	0	209	9
Florida	104	4	100	20	80	4	1,450	65
Georgia	57	5	56	12	44	0	840	39
Hawaii	10	1	10	7	3	0	109	4
Idaho	6	0	6	5	1	0	48	3
Illinois	74	8	67	32	35	7	1,006	55
Indiana	29	2	29	20	9	0	340	20
Iowa	14	4	13	11	2	0	149	13
Kansas	12	2	9	1	8	2	150	9
Kentucky	19	3	18	6	12	0	208	12
Louisiana	61	6	58	13	45	0	639	30
Maine	5	1	5	3	2	0	56	5
Maryland	39	3	38	10	28	1	516	27
Massachusetts	29	9	27	17	10	0	323	22
Michigan	42	10	38	27	11	2	528	30
Minnesota	19	4	19	18	1	0	238	8
Mississippi	23	1	23	2	21	0	311	8

See footnote at end of table.

Table 42 - Continued
Number of certified end stage renal disease providers of service, type of service,
and number of approved dialysis stations, by State: December 1987

State	Total providers of service ¹	Hospital transplant centers	Outpatient dialysis facilities			Inpatient hospital dialysis centers	Approved dialysis stations	Facilities training in self-dialysis
			Total	Hospital	Freestanding			
Missouri	42	9	38	20	18	3	426	35
Montana	4	0	4	4	0	0	33	4
Nebraska	10	2	8	7	1	2	69	8
Nevada	4	0	4	2	2	0	57	4
New Hampshire	4	0	4	2	2	0	36	4
New Jersey	28	3	28	22	6	0	523	20
New Mexico	17	2	15	8	7	0	146	12
New York	107	13	107	77	30	0	1,355	77
North Carolina	35	5	35	7	28	0	684	21
North Dakota	5	0	5	5	0	0	43	4
Ohio	44	11	44	30	14	0	558	32
Oklahoma	27	5	27	21	6	0	229	12
Oregon	10	1	10	6	4	0	125	9
Pennsylvania	97	9	90	38	52	7	1,161	73
Puerto Rico	15	1	15	7	8	0	256	10
Rhode Island	6	0	6	2	4	0	103	5
South Carolina	34	1	33	2	31	1	444	14
South Dakota	8	0	8	8	0	0	47	3
Tennessee	53	4	49	4	45	1	592	22
Texas	128	16	117	26	91	3	1,904	80
Utah	13	3	12	5	7	0	106	8
Vermont	1	1	1	1	0	0	14	1
Virgin Islands	2	1	2	2	0	0	6	0
Virginia	49	4	49	15	34	0	614	34
Washington	19	5	16	8	8	0	167	10
West Virginia	14	1	14	7	7	0	137	10
Wisconsin	24	2	23	20	3	1	226	21
Wyoming	1	0	1	0	1	0	7	1
American Samoa	1	0	1	1	0	0	2	0
Guam	1	0	1	1	0	0	6	1
Mariana Islands	1	0	1	0	1	0	5	0

¹ Categories do not add to total because some hospital transplant centers also provide outpatient services and are again counted in that category.

SOURCE: Health Care Financing Administration, Bureau of Data Management and Strategy: Data from the Program Management and Medical Information System, December 1987.

End stage renal disease studies

Centers for Disease Control survey

The Centers for Disease Control (CDC) annually surveys dialysis facilities using their Form 53.7, "National Surveillance of Dialysis - Associated Hepatitis and Other Diseases." The CDC form is mailed by the Health Care Financing Administration to Medicare dialysis facilities along with the HCFA-2744, End Stage Renal Disease Facility Survey. As CDC surveys are received, they are forwarded to CDC for appropriate analyses.

Following is an explanation of the contents of the report entitled, "National Surveillance of Dialysis-Associated Diseases in the United States, 1987."

National Surveillance of Dialysis-Associated Diseases in the United States, 1987

by Miriam J. Alter, Ph.D. and
Martin S. Favero, Ph.D.

"In conjunction with the annual facility survey performed by the Health Care Financing Administration (HCFA) for calendar year 1987, the Centers for Disease Control (CDC) distributed by mail a questionnaire to all 1,630 chronic hemodialysis centers currently operating and licensed by HCFA. The reported incidence and prevalence of hepatitis B virus (HBV) infection among patients and staff was measured by using hepatitis B surface antigen (HBsAg) and antibody to HBsAg (anti-HBs) as markers. Incidence was defined as the percentage of patients or staff present in the facility for at least 1 month in 1987 who became positive for HBsAg during 1987. Prevalence was defined as the percentage of patients or staff present in the facility during the first week of December 1987 who were positive for HBsAg or for anti-HBs. Estimates of the cumulative number of patients and staff members susceptible to HBV (eligible for hepatitis B vaccine) were obtained by subtracting the number of patients and staff members positive for HBsAg and anti-HBs reported in a similar survey performed in 1982 (prior to nationwide use of vaccine) from the total number of patients and staff members reported in 1987.

Other data collected included:

- management of HBsAg-positive patients;
- frequency of HBsAg serologic screening;
- use of hepatitis B vaccine;
- incidence of non-A, non-B hepatitis among patients and staff
- occurrence of pyrogenic reactions and septicemia (number of reactions and their occurrence in clusters);
- incidence and case fatality rate of dialysis dementia;
- occurrence of new dialyzer syndrome;
- number of patients on high flux dialysis;
- practices associated with reuse of dialyzers, dialyzer caps, bloodlines, and transducer filters;

- procedures for cleaning and disinfection;
- number of patients undergoing chronic dialysis known to have Human Immunodeficiency Virus (HIV) infection.

Questionnaires were returned by 1,486 of 1,630 centers, a response rate of 91 percent. These centers represented 97,225 patients and 27,123 staff members. All questionnaires were edited for accuracy and consistency of responses. When necessary, facilities were recontacted (approximately 500) for clarification of data. Data were analyzed with use of the chi square test and Fisher's exact test for differences in proportions. The Mantel-Haenszel combined odds ratio was used when adjustment of confounding variables was required. A *p* value less than .05 was considered significant."

Please refer any questions or requests for this report to: Hepatitis Branch (Division of Viral Diseases), or Nosocomial Infections Laboratory Branch (Hospital Infections Program), Center for Infectious Diseases, Centers for Disease Control, Atlanta, Georgia 30333.

Health Care Financing Administration grant activity summaries

The Health Care Financing Administration is presently involved in many research activities that deal with or touch on the end stage renal disease program. These activities range from internal HCFA reviews to full-scope extramural studies that are covered under the grant or cooperative agreement process.

Summaries of these activities follow.

End Stage Renal Disease

Design of a Demonstration and Assessment of Competitive Health Insurance Proposals in the End Stage Renal Disease Program

Project No.:	14-C-98275/3-03
Period:	March 1983-June 1988
Funding:	\$ 1,472,772
Award:	Cooperative Agreement
Awardee:	The Urban Institute Health Policy Center 2100 M Street, NW. Washington, D.C. 20037
Project Officer:	Bonnie Edington Division of Health Systems and Special Studies

Description: The purpose of the initial award was to determine the feasibility of demonstrations to test competitive financing approaches in the end stage

renal disease (ESRD) program. In 1985, a competitive bidding demonstration was implemented but was unsuccessful. In 1986 and 1987, the project consisted of a series of papers related to the feasibility of competitive financing for ESRD. In 1988, under this cooperative agreement, Urban Institute initiated a study of access to kidney transplantation.

Status: Urban Institute studied the competitive bidding demonstration and prepared the following reports:

- "Implementing Competitive Bidding in Public Medical Programs," September 1985.
- "Competitive Bidding and Vouchers for Kidney Dialysis," January 1986.
- "Privatization and Bidding in the Health Care Sector," October 1986.

Additional reports produced by the Urban Institute under this cooperative agreement and related to the feasibility of competitive financing for ESRD include:

- "How to Measure Case-Mix Differences," June 1986.
- "Measures of Case-Mix in the End Stage Renal Disease Program," May 1987.
- "Full Capitation for End Stage Renal Disease Services," October 1987.

Capitation Payment System for all End Stage Renal Disease Services

Project No.: 95-C-98497/9-02
Period: January 1985-April 1988
Funding: \$ 424,426
Award: Cooperative Agreement
Awardee: El Camino Hospital District Corporation
2500 Grant Road
Mountain View, Calif. 94042
Project: Bonnie Edington
Officer: Division of Health Systems and Special Studies

Description: The purpose of this project was to develop and test the concept of a disease management organization under which capitation payments would cover all Medicare benefits for end stage renal disease (ESRD) patients.

Status: The project had 3 years of planning and development, and concluded when implementation proved to be infeasible. The awardee was unable to recruit the necessary number of providers to show that it would be cost effective to change the method of reimbursement under the Medicare program for ESRD patients. Without adequate support for the approach, as designed, it was decided not to proceed with the implementation of the demonstration.

Learning From and Improving Diagnosis-Related Groups for End Stage Renal Disease Patients

Project No.: 14-C-98596/3-02
Period: September 1984-May 1987
Funding: \$ 350,000
Award: Cooperative Agreement
Awardee: The Urban Institute
Health Policy Center
2100 M Street, NW.
Washington, D.C. 20037

Project Officer: Paul W. Eggers
Division of Beneficiary Studies

Description: The introduction of prospective payment by diagnosis-related groups has drastically altered the incentives in medical care. The purpose of this project is to study the responses of providers at the level of individual patients and diagnoses in end stage renal disease, an area on which abundant data are available. Specific issues to be addressed include the possibility of selection of diagnoses to maximize reimbursement, alteration of discharge and admission patterns and other forms of cost shifting, and the selection of patients for admission. Specifically, patients will be characterized in terms of major demographic and prognostic factors, including measures of severity of illness. Patterns of diagnostic categorization, admission patterns, and treatment costs will be compared for homogenous groups before and after the prospective payment system.

Comparative Analysis of the Cost and Outcomes of Kidney Transplants

Project No.: 14-C-98564/0-03
Period: July 1984-December 1988
Funding: \$ 1,171,684
Award: Cooperative Agreement
Awardee: Battelle Human Affairs Research Center
4000 NW., 41st Street
Seattle, Wash. 98105

Project Officer: Paul W. Eggers
Division of Beneficiary Studies

Description: This is a multicenter observational study of the impact of cyclosporine on renal transplantation. A sample of 396 patients contributed by five major centers experienced in the use of cyclosporine is being studied indepth. Detailed information on outcomes (mortality, complications, and disability) and costs were collected on this sample and analyzed in terms of major prognostic factors. In addition, extensive data of a medical or biologic and of a sociologic nature have been obtained. The representativeness of the sample has been validated by comparison with the universe of patients treated with cyclosporine for whom more limited information is available in the Health Care Financing Administration Medical Information System data base.

Status: A collaboration with the scientific studies committee of the American Society of Transplant Surgeons was formalized, and a working group of physicians to advise and guide the biomedical component of the study was empaneled and has met twice. The supplementary questionnaires designed to gather medical data were drafted and finalized after review by the medical working group. Patient selection criteria have been finalized. Participating transplant centers have been selected, and subcontracts for data acquisition have been negotiated. The second year of the project was devoted largely to data collection. Five transplant centers agreed to participate in the study: University of California, San Francisco; Ohio State University; University of Pittsburgh; University of Texas, Houston; and University of Wisconsin. Data collection was completed by December 1987.

Waiver for the Northwest Kidney Center, Seattle, to be Reimbursed Directly for Providing Home Dialysis Training Services

Project No.: 95-C-98485/0-03
 Period: November 1984-October 1987
 Funding: Waiver Only
 Award: Cooperative Agreement
 Awardee: Northwest Kidney Center
 700 Broadway
 Seattle, Wash. 98122
 Project Officer: Bonnie M. Edington
 Division of Health Systems and Special Studies

Description: The Northwest Kidney Center (NKC) conducted a pilot test of a regionalized home dialysis training program to test the feasibility of Seattle-based NKC staff providing home hemodialysis training services to patients onsite at dialysis facilities and homes elsewhere in Washington State. The purpose was to enable larger numbers of patients to choose home dialysis.

Status: Over a 3-year period, 32 patients were trained for home dialysis at 3 facilities remote from Seattle. No patients were positive for hepatitis; therefore, none were trained at home. Almost all patients utilized a paid helper rather than a family member. Additional costs associated with sending staff from Seattle to do training at remote sites averaged \$516 per patient for initial training, and \$383 for retraining. The proportion of dialysis patients who chose home dialysis did not increase over the 3 years but actually decreased.

Severity of Illness in End Stage Renal Disease Population in Northern Florida

Project No.: 14-C-98696/4-02
 Period: September 1984-December 1988
 Funding: \$ 509,356
 Award: Cooperative Agreement
 Awardee: University of Florida
 Grinter Hall
 Gainesville, Fla. 32610

Project Officer: Paul W. Eggers
 Division of Beneficiary Studies

Description: The purpose of this study is to develop and test measures of severity of illness that predict resource consumption levels in the end stage renal disease (ESRD) program. These measures will be based on the acute physiology and chronic health evaluation (APACHE) system, which was developed to measure therapeutic effort and resource costs in intensive care units. Two components of APACHE, the therapeutic intervention scoring system (TISS) and the acute physiology score (APS), will be adapted to the special characteristics of the ESRD patient receiving dialysis. TISS and APS will then be used to measure ESRD case mix and resource consumption.

Status: The major activity of the first year of this study involved the development of an instrument to measure severity of illness variations in the chronic hemodialysis population. The instrument includes: physiologic measures, dialysis treatment variations, measures of comorbidities, as well as socioeconomic and behavioral factors. Final revisions to the instrument were made in June 1985, based on comments from a technical advisory panel and reviews of patients' charts in ESRD facilities to determine data availability. Seven hemodialysis units have agreed to participate in the study. The number of patients included in the study was 527,240 persons from free-standing dialysis facilities and 287 persons from hospital-based facilities. Data collection began in Fall 1985. Second-year activities mainly involved data collection. The final phase of the project involves developing scaling and weighting indices for both patient severity and resource consumption.

End Stage Renal Disease Nutritional Therapy Study

Period: September 1984-August 1994
 Award: Interagency Agreement
 Agency: National Institutes of Health
 National Institute of Diabetes and Digestive and Kidney Disease
 Bethesda, Md. 20892
 Project Officer: Arne H. Anderson
 Division of Health Systems and Special Studies

Description: In accordance with the congressional mandate (Public Law 96-499), this study, known as the Modification of Diet in Renal Disease Study, is a multicenter cooperative clinical study designed to ascertain whether restriction of dietary protein and phosphorus and/or reduction of blood pressure well below the currently accepted target of 140/90 will reduce the rate of progression of chronic renal disease irrespective of the nature of the primary underlying process. The study is being conducted jointly by the National Institutes of Health and the Health Care Financing Administration (HCFA).

Status: Phase I, the developmental phase, began in September 1984 and concluded in December 1985.

This phase produced a clinical protocol, forms manual, and operation manual. Phase II, a 2-year pilot study, began in January 1986 at nine clinical sites. Phase III, the full-scale clinical study, is scheduled to begin in January 1989 at 15 clinical sites and to run until December 31, 1992. At the conclusion of this phase, HCFA is responsible for conducting the cost-effectiveness component of the study. The following questions will be addressed in the cost analysis to be conducted by HCFA:

- Is nutrition therapy cost effective in the treatment of patients in the study?
- Is nutritional therapy less costly to HCFA than the current payment for dialysis and transplantation?
- Is nutrition therapy under HCFA administratively feasible?
- Can the therapy be effectively managed?

Data Quality Assessment for Cost-Effectiveness Analysis of the Modification of Diet in the Renal Disease Study

Project No.: 99-C-98526/1-05
 Period: May 1987–October 1988
 Funding: \$ 50,000
 Award: Cooperative Agreement
 Awardee: Brandeis University Research Center
 (See page 66)
 Task: Bonnie M. Edington
 Leader: Division of Health Systems and
 Special Studies

Description: This project is to develop two issue papers to assist in planning for the analysis of the Modification of Diet in the Renal Disease (MDRD) study. The MDRD study is congressionally mandated and funded jointly by the Health Care Financing Administration and the National Institutes of Health. It is a clinical trial of the effectiveness of nutritional therapy (primarily protein restriction) on patients with progressive kidney disease, in terms of delaying or obviating the need for dialysis.

Status: The first issue paper entitled, “Benign Moral Hazard: Diet Therapy for Progressive Kidney Failure” was received in June 1988. The second paper entitled, “Assessment of Data Quality in Renal Disease” was received in November 1988.

Relative Effectiveness and Cost of Transplantation and Dialysis in End Stage Renal Disease

Project No.: 14-C-98372/5-04
 Period: September 1983–April 1989
 Funding: \$ 1,811,126
 Award: Cooperative Agreement
 Awardee: University of Michigan
 Department of Epidemiology
 109 Observatory Street
 Ann Arbor, Mich. 48109
 Project: Carl E. Josephson
 Officer: Division of Program Studies

Description: This study will perform a comprehensive assessment of the cost effectiveness of end stage renal disease treatment under different treatment modalities, an assessment of the impact of cyclosporine on transplant success, and a life-table analysis of risk factors for patient and graft survival. The study will use data from the Michigan Kidney Registry, supplemented by survey information and medical record abstractions. Because of the design of the study, it is anticipated that the project will demonstrate the utility of a longitudinal, patient-specific data system for policy decisionmaking at the Federal level.

Status: The awardee has made significant progress in all phases of this project. The basic research design is a phased cohort analysis of renal patients entering treatment modalities over two periods, 1981–83 and 1984–86. Analysis of the data from the second cohort is being performed in the three main research areas: quality of life, survival, and cost effectiveness. Additionally, progress continues in the secondary goals of the research project, such as identifying diabetic etiological factors in end stage renal disease, using the Michigan Kidney Registry data for a variety of research purposes, and studying the relationship between immunosuppressive agents and malignant tumors.

Cause and Failure to Transplant Cadaveric Human Organs

Project No.: 17-C-98728/1-01
 Period: August 1986–July 1989
 Funding: \$ 699,740
 Award: Cooperative Agreement
 Awardee: Brandeis University
 415 South Street
 Waltham, Mass. 02254
 Project: Paul W. Eggers
 Officer: Division of Beneficiary Studies

Description: The project will determine the reasons for the high rate (19.6 percent) of wastage of cadaveric kidneys in the United States and make recommendations to reduce this loss in the future. Many studies have shown that kidney transplantation is beneficial both clinically and from a cost perspective. The major barrier to increased transplantation is organ availability. This study, through its measure of determinants of, and cures for, cadaver organ wastage, could help increase the efficiency of the organ procurement system. A second part of the project, funded by the Public Health Service through an interagency agreement, is an analysis of the status, efficiency, and effectiveness of the organ procurement system in the United States. This part is congressionally mandated under Section 375 of the Public Health Service Act, as added by Public Law 98-507 of the National Organ Transplant Act.

Status: Phase I completed a preliminary analysis of the status of organ procurement in 1986, and the findings have been delivered to the Public Health Service. This includes: descriptive analyses such as size and

volume of activity, donor characteristics, organization structure, personnel, and measures of efficiency. Phase II of the study will entail the tracking of kidneys from harvest through transplantation or inability to place (i.e., wastage). This will enable accurate estimates to be made of true wastage rates. Through the first 3 months of 1988, 637 harvested kidneys were tracked, of which 35 were discarded. The major reasons for loss were anatomical abnormalities, donor/organ pathology, and surgical complications. Data collection will continue through December 1988 at which time it is anticipated that information will be available on 3,000 kidneys with discard information on 230 to 300 kidneys. Phase III will consist of an in-depth analysis of six agencies determined to be efficient (in terms of low wastage rates), in order to make recommendations about potential changes that could be made in the organ procurement area.

Predictors of Cost and Success in Kidney and Heart Transplantation

Project No.: 17-C-99183/0-01
 Period: June 1988-June 1990
 Funding: \$ 200,000
 Award: Cooperative Agreement
 Awardee: Battelle Human Affairs Research Centers
 4000 NE. 41st Street
 Seattle, Wash. 98105
 Project Officer: Lawrence E. Kucken
 Division of Beneficiary Studies

Description: This project will examine the patient and organizational characteristics that determine successful kidney and heart transplantation outcomes. Using multivariate life-table methods, data from the Medicare program will be combined with information from surveys of transplant facilities to construct a model of transplant facility effectiveness.

Status: Data preparation activities are currently under way. Publicity materials are being developed for distribution to transplant centers. Forms for primary data collection are being drafted, and secondary data tapes have been requested.

Impact of Payment Changes on Medicare: Case of End Stage Renal Disease

Project No.: 17-C-99021/3-01
 Period: June 1987-June 1989
 Funding: \$ 500,000
 Award: Cooperative Agreement
 Awardee: The Urban Institute
 Health Policy Center
 2100 M Street, NW.
 Washington, D.C. 20037
 Project Officer: Samuel McNeill
 Division of Program Studies

Description: This project is part of an ongoing effort to monitor several components of Medicare's end stage

renal disease (ESRD) program. The major thrust of this project will be to measure the impact of two recent reductions in the composite payment rate on access to and quality of care provided to ESRD patients. Information for this study will be derived from summaries of medical care records and other supplementary sources for past patients in both hospital-based and freestanding dialysis centers. The initial effort will concentrate on an assessment of the impact of the \$12 reduction of the composite rate in 1983. This will include analysis of morbidity and mortality associated with ESRD in concert with the study mandated by Congress. This aspect was specified in Section 9335(b)(2) of the Omnibus Budget Reconciliation Act of 1986. As soon as the data becomes available, the same protocol will be followed to measure the impact of the additional \$2 composite rate reduction instituted in 1986. Another issue under study in this project is the impact of dialyzer reuse on patient mortality, morbidity, and kidney transplantation, which is part of the Health Care Financing Administration's ongoing interest in measuring and tracking ESRD patient outcomes.

Status: An interim Report to Congress has been received and is being reviewed.

Estimating Cost of Training for Self-Dialysis

Project No.: 99-C-98526/1-05
 Period: August 1988-March 1989
 Funding: \$ 34,000
 Award: Cooperative Agreement
 Awardee: Brandeis University Research Center
 (See page 66)
 Task Leader: Carl E. Josephson
 Division of Program Studies

Description: The project's objective is to develop a plan of analysis to estimate the cost of training end stage renal disease patients in performing self-dialysis. The basic approach will use an estimation of cost functions using the cost data supplied to the Health Care Financing Administration (HCFA) as part of the annual cost report. Other data under consideration include those from the Medicaid Management Information Systems and claims information made available to HCFA researchers.

Status: The project is in the early developmental stage.

End Stage Renal Disease Annual Research Report

Funding: Intramural
 Project: Paul W. Eggers
 Director: Division of Beneficiary Studies

Description: This report reflects a wide range of data and analyses regarding the end stage renal disease (ESRD) program. Much of the data in this report emphasize trends and comparisons over time, making this report a standard reference source which illustrates changes in the nature of the Medicare end stage renal

Appendix A

Glossary of terms

Access device - A piece of equipment or a mechanism designed for access to the patient's bloodstream (for hemodialysis) or to the peritoneal membrane (for peritoneal dialysis).

Agreement - A written document executed between an ESRD facility and another facility in which the other facility agrees to assume responsibility for furnishing specified services to patients and for obtaining reimbursement for those services.

Arrangement - A written document executed between an ESRD facility and another facility in which the other facility agrees to furnish specified services to patients but the ESRD facility retains responsibility for those services and for obtaining reimbursement for them.

Backup dialysis - A dialysis session furnished to an ESRD patient which is outside the patient's routine dialysis setting, e.g., a home patient dialyzing in the facility or an in-facility patient transferred to a back-up facility.

Backup hospital - A hospital with whom a dialysis facility has a written agreement under which inpatient hospital care or other hospital services are available promptly to the dialysis facility's patients when needed.

Beneficiary - One who is entitled to have Medicare benefits paid on his behalf.

Continuous ambulatory peritoneal dialysis (CAPD) - A type of peritoneal dialysis whereby the patient dialyzes at home, using special supplies, but without the need for a machine.

Cadaver donor transplant - The surgical procedure of excising a kidney from a cadaver and implanting it into a suitable recipient.

Chronic maintenance dialysis - Dialysis which is regularly furnished to an ESRD patient in either a hospital-based, independent (nonhospital based), or home setting.

Continuous cycling peritoneal dialysis (CCPD) - A variant of CAPD in which a machine is used to make exchanges at night automatically.

Dialysis - A process of maintaining the chemical balance of the blood when the kidneys have failed; specifically, a process by which dissolved substances are removed from the patient's body by diffusion from one fluid compartment to another across a semi-permeable membrane. The types of dialysis currently used are hemodialysis, peritoneal dialysis, continuous ambulatory peritoneal dialysis (CAPD), and continuous cycling peritoneal dialysis (CCPD).

Dialysis center - A hospital unit which is approved to furnish the full spectrum of diagnostic, therapeutic, and rehabilitative services required for the care of ESRD dialysis patients (including inpatient dialysis) furnished directly or under arrangement.

Dialysis facility - A unit (hospital-based or freestanding) which is approved to furnish dialysis service(s) directly to ESRD patients.

Dialysis station - The treatment area which is designed and equipped to provide adequate and safe dialysis therapy, as well as privacy and comfort for patients.

Dialysis treatments - The number of treatments performed for ESRD patients.

Disposition of cadaveric kidneys - The final disposition of acquired cadaveric kidneys.

End stage renal disease (ESRD) - That stage of renal impairment which is irreversible and permanent and requires dialysis or kidney transplantation to ameliorate uremic symptoms and maintain life.

ESRD facility - A supplier of health care services that is approved to furnish at least one specific ESRD service.

ESRD network - A legislatively mandated group of ESRD providers in a designated area which, by their type and location and because of local referral patterns, collectively furnish the necessary care for ESRD patients in the population served.

ESRD Medicare beneficiary - A person qualifying for Medicare by means of the renal disease provision of the law and eligible for the full range of benefits available under the health insurance program, not just for those services relating to renal care.

ESRD patient - A person with irreversible and permanent kidney failure.

ESRD service - Treatment or care (e.g., dialysis, transplantation, supplies) usually rendered to those diagnosed as having ESRD.

Eligibility requirements - To qualify for Medicare under the renal provision, a person must have end stage renal disease and either: be entitled to a monthly insurance benefit under title II of the Social Security Act (or an annuity under the Railroad Retirement Act); or be fully or currently insured under Social Security (railroad work may count); or be the spouse or dependent child of a person who meets at least one of these last two

requirements There is no minimum age for eligibility under the renal disease provision. An application for Medicare must be filed (effective October 1, 1978).

Enrolled/entitled - An individual who has filed an enrollment request and meets all other eligibility requirements for Medicare will be enrolled in Part A (hospital insurance) and, if elected, in Part B (supplemental medical insurance) of the Medicare program.

Hemodialysis - A method of dialysis in which blood from a patient's body is circulated through an external device or machine and thence returned to the patient's bloodstream. Such an artificial kidney machine usually is designed to remove fluids and metabolic end products from the bloodstream by placing the blood in contact with a semi-permeable membrane which is bathed on the other side by an appropriate chemical solution referred to as dialysate.

Home patients - Those patients who maintain their own dialysis equipment at home and perform their own treatment alone or with the assistance of a helper. These are patients who are capable of performing dialysis at home after being trained.

Inpatient care only - A renal dialysis center which performs backup services for dialysis facilities and performs 20 percent or less of its dialysis on an outpatient basis.

Inpatient dialysis - Dialysis which, because of medical necessity, is furnished to an ESRD patient on a temporary inpatient basis in a hospital.

In-unit (in-facility) patients - Those patients whose dialysis is performed by staff in a dialysis unit or facility, or who dialyze themselves in a unit or facility.

Living-related donor transplant - The surgical procedure of excising a kidney from a living relative of the patient and implanting it in the patient.

Lost to followup (LTFU) - A category of patients whose current status is unknown to the facility which at one time had been dialyzing/following the patient.

Number of dialysis treatments given (other than home) - The number of times dialysis machines were used to provide patient treatments.

Number of centers by number of transplants - The number of centers performing a specified number of transplants for the survey period.

Number of facilities/centers surveyed - The number of individual facilities/centers completing the ESRD Facility Survey form.

Number of patients completing self-dialysis training course - The number of patients who have completed a certified training program teaching them to perform their own renal dialysis treatments in the home or on an outpatient basis alone or with the assistance of a helper.

Organ procurement - The process of acquiring donor kidneys.

Organ Procurement Agency (OPA) - An organization which performs or coordinates the performance of all the following services: procurement of donated kidneys; preservation of donated kidneys; transportation of donated kidneys; and maintenance of a system to locate prospective recipients for procured organs.

Patients awaiting transplant - The number of patients dialyzing at or being followed by a facility who are medically able to receive a transplant, have given consent for a transplant, and are on an active transplant list.

Patients completing self-dialysis training course - Patients who have completed a certified training program teaching them to perform their own renal dialysis treatments in the home or on an outpatient basis alone or with the assistance of a helper.

Peritoneal dialysis - A procedure that introduces dialysate into the abdominal cavity to remove waste products through the peritoneum (a membrane which surrounds the intestines and other organs in the abdominal cavity). It functions in a manner similar to that of the (artificial) semi-permeable membrane in the hemodialysis machine. Two other forms of peritoneal dialysis are continuous ambulatory peritoneal dialysis and continuous cycling peritoneal dialysis.

Provider number - An assigned Medicare identification number for billing which consists of six positions. The first two positions represent a State code. The third and fourth positions represent the type of provider of services. For renal providers, the coding is as follows: 0 in 3rd position = short-stay hospital; 20 in 3rd and 4th positions = long-term care hospital; 25 or 26 in 3rd and 4th positions = independent renal facilities; 33 in 3rd and 4th positions = pediatric (children's) hospital; and 35 in 3rd and 4th positions = hospital satellite renal facility (hospital satellites are owned and operated by hospitals).

For example: 01 0001 = hospital in Alabama; 05 2500 = independent in California; and 14 3500 = hospital satellite in Illinois.

Program Management and Medical Information System (PMMIS) - A system which contains, in part, medical information on patients and the services that they have received during the course of their therapy. The ESRD PMMIS is an automated system of medical records that

deals primarily with current Medicare-entitled ESRD patients but also maintains historical information on persons no longer classified as ESRD patients by reason of death or successful transplantation. In addition, it contains information on ESRD facilities and facility reimbursement.

Receiving service - Includes all patients who receive either kidney dialysis or kidney transplant services.

Renal dialysis center - A hospital unit approved to furnish the full spectrum of diagnostic, therapeutic (including patient dialysis furnished directly or under arrangement) and rehabilitative services, except renal transplantation, for the care of ESRD dialysis patients.

Renal dialysis facility - A unit (hospital-based or freestanding) that is approved to furnish dialysis services to ESRD patients.

Renal network - A legislatively mandated group of ESRD facilities in a designated area which, by their type and location and because of local referral patterns, collectively furnish the necessary care for ESRD patients in the population served.

Renal transplant center - A hospital unit which is approved to furnish direct transplantation and other medical and surgical specialty services for the care of ESRD transplant patients, including inpatient dialysis furnished directly or under arrangement.

Restarted dialysis - A category of ESRD patients who, at one time, were on chronic maintenance dialysis, left that treatment category for reasons other than a transplant (e.g., recovered kidney function), then returned to dialysis.

Self-care services - A service provided by a dialysis facility or center where patients who have been trained to perform self-dialysis with little or no professional assistance dialyze.

Self-dialysis - Dialysis performed with little or no professional assistance by an ESRD patient who has completed an appropriate course of training.

Self-dialysis patients - Patients who have been trained in dialysis techniques and dialyze themselves in a dialysis facility or at home without professional assistance. Patients who are entirely responsible for administering their own dialysis treatments without professional support (except in emergency situations) are in this category.

Self-dialysis training and home training - Programs that train ESRD patients to perform self-dialysis or home

dialysis with little or no professional assistance and train other individuals to assist patients in performing self-dialysis or home dialysis.

Special purpose facility - A renal facility which is approved to furnish dialysis at special locations on a short-term basis to a group of dialysis patients otherwise unable to obtain treatment in the geographical area. The special locations must be either special rehabilitative (including vacation) locations servicing ESRD patients temporarily residing there, or locations in need of ESRD facilities under emergency circumstances.

Staff-assisted dialysis - Dialysis performed by the staff of the renal dialysis center or facility.

Started for first time ever - A category of ESRD patients who have been newly diagnosed as having ESRD, and have begun chronic maintenance dialysis; or, newly diagnosed ESRD patients who, after being stabilized on dialysis, completed a course of self-dialysis training and have begun dialyzing at home or self-dialyzing at a facility.

Survey period - The period January 1 through December 31 of each year for which all ESRD facilities must complete for HCFA-2744, ESRD Facility Survey.

Training service - A program that trains ESRD patients to perform self-dialysis or home dialysis with little or no professional assistance, and trains other individuals to assist patients in performing self-dialysis or home dialysis.

Transient patients - Patients who are treated by facilities episodically (less than 51 percent of the survey period), e.g., vacationers.

Transplant - The surgical procedure that involves excising an organ from either a cadaver or from a living donor and implanting it in the recipient.

Transplant center - A hospital unit which is approved to furnish direct transplantation and other medical and surgical specialty services for the care of the ESRD transplant patients, including inpatient dialysis furnished directly or under arrangement.

Transplants performed - The number of kidneys transplanted by donor source type, i.e., living-related or cadaveric.

Treatment setting - The type and location of the dialysis treatment being performed, i.e., self-dialysis (in-unit or home), self-dialysis training, or staff-assisted dialysis.

Appendix B

Entitlement provisions

The 1972 Amendments to the Social Security Act extended Medicare coverage to individuals with end stage renal disease beginning July 1973, the month the law became effective. End stage renal disease is that stage of kidney impairment which is irreversible, cannot be controlled by conservative management alone, and requires dialysis or kidney transplantation to maintain life.

As soon as an individual knows that he needs maintenance dialysis treatments, he should apply for Medicare at any social security office. Social security representatives will help the applicant furnish all necessary information and answer questions he may have about the Medicare program. One of the essential forms to be completed will be a HCFA-2728, Chronic Renal Disease Medical Evidence Report. Notification of entitlement will be mailed later. If a person cannot come to the social security office, arrangements can be made so that a representative can visit the person to take an application.

When entitlement to hospital insurance (Part A) is established, the individual is automatically enrolled for supplementary medical insurance (Part B) to begin the same month, unless he specifies he does not want this coverage.

It is not in the best interest of most persons with end stage renal disease to decline Part B coverage because many renal services, such as outpatient dialysis treatments, are covered only under Part B. A person qualifying for Medicare by means of the renal disease provision is eligible for the full range of benefits available under the health insurance program, not just for those services relating to renal care.

Nature of 1978 amendments

The 1978 Amendments to the Social Security Act made a number of changes in the rules governing entitlement to Medicare based on end stage renal disease. The changes were designed to encourage self-dialysis and transplantation and to eliminate a number of inequities and difficulties that existed under previous law. The following changes became effective October 1, 1978:

- *Age 65 restriction removed*--Prior to October 1, 1978, persons 65 years of age or over were ineligible for Medicare based on end stage renal disease. This restriction has been eliminated.
- *Application requirement*--On claims for entitlement beginning October 1, 1978 and later, an application must be filed, with retroactivity limited to no more than 12 months before the month of filing.
- *Early entitlement based on hospitalization for transplant surgery*--Entitlement may begin during a month in the qualifying period if, during that period, the individual is hospitalized for transplant procedures, and the

transplant takes place no later than 2 months thereafter.

- *Waiver of qualifying period based on self-dialysis training*--The qualifying period is waived for persons who during the qualifying period participate in self-dialysis training and are expected to complete the training successfully and self-dialyze thereafter.
- *36 months of post-transplant entitlement*--Entitlement terminates 36 months (rather than 12 months, as under previous law) after the month in which an individual undergoes kidney transplantation.
- *No second qualifying period after termination of R-HI (health insurance based on entitlement because of renal provision of the law)*--An individual whose entitlement to Medicare on the basis of ESRD has ended will be reentitled as of the month his new course of dialysis begins, subject to the filing of a timely application.

Requirements for eligibility

To qualify for Medicare under the renal provision, a person must have end stage renal disease and either: be entitled to a monthly insurance benefit under title II of the Social Security Act (or an annuity under the Railroad Retirement Act); or be fully or currently insured under Social Security (railroad work may count); or be the spouse or dependent child of a person who meets at least one of these last two requirements. There is no minimum age for eligibility under the renal disease provision. An application for Medicare must be filed (effective October 1, 1978).

When entitlement begins

Provided all eligibility requirements are met, a person's Medicare entitlement based on the renal provision of the law begins with one of four occurrences.

- The third month after the month in which a course of dialysis is initiated. For example, if a course was initiated any time during the month of January, the date of entitlement would be April 1 (Table B-1).
- If earlier, the month a course of maintenance dialysis begins if the individual participates within the waiting period in a self-dialysis training program in an approved facility and is expected to complete the training successfully and self-dialyze thereafter (effective October 1, 1978).
- If earlier, the month of transplant.
- If earlier, the month an individual is admitted to an approved hospital for procedures preliminary to a transplant, if the transplant takes place within the following 2 months. If the transplant is delayed more than 2 months, Medicare coverage will begin the second month prior to the month the actual transplant takes place, or, if earlier, the first day of the third month after maintenance dialysis began (effective October 1, 1978).

Table B-1
Effective date chart for patients applying for
ESRD benefits

Regular course of dialysis initiated	Date of entitlement
January	April 1
February	May 1
March	June 1
April	July 1
May	August 1
June	September 1
July	October 1
August	November 1
September	December 1
October	January 1
November	February 1
December	March 1

When entitlement ends

A person's entitlement to this provision terminates with the earliest of the following events:

- The day of death; or
- The last day of the 12th month after a person no longer requires maintenance dialysis treatments; or
- The last day of the 36th month after the month in which the individual receives a kidney transplant. If within 36 months after transplantation the person requires another transplant or returns to dialysis, there is no interruption in entitlement (effective October 1, 1978).

Appendix C

End stage renal disease data sources

Form title and number	Primary purpose	PMMIS function	Research potential
Outpatient Bill (HCFA-1483)	Billing	Dialysis incidence	Prevalence and outcome analyses.
Outpatient Service (UB-2)	Billing	Dialysis incidence	Prevalence and outcome analyses.
Inpatient Bill (HCFA-1453)	Billing	Inpatient stay diagnosis	Morbidity.
Inpatient Service (UB-2)	Billing	Inpatient stay diagnosis	Morbidity.
ESRD Transplant Information (HCFA-2745-U4)	Clinical information	Transplant incidence	Clinical research: Efficacy of treatment, prevalence, and outcome analyses.
ESRD Transplant Follow-up (no number)	Clinical rehabilitative information	Patient and graft survival and rehabilitation	Clinical research: Efficacy of treatment and outcome analysis.
ESRD Death Notification (HCFA-2746)	Death incidence	Death incidence, cause of death	Outcome analyses.
CRD Medical Evidence Report (HCFA-2728-U4)	Entitlement	Identification of primary disease and first date of treatment	Incidence and outcome analyses.
ESRD Facility Survey (HCFA-2744)	Number of Medicare and non-Medicare patients by modality	National overview of Medicare and non-Medicare patients by modality	Incidence, prevalence, and outcome analyses.

NOTES: PMMIS is Program Management and Medical Information System. HCFA is Health Care Financing Administration. CRD is chronic renal disease. UB is uniform bill.

APPENDIX D

HEALTH CARE FINANCING ADMINISTRATION

REGIONAL OFFICE BOUNDARIES



U.S. Department of Health and Human Services
Louis W. Sullivan, M.D., *Secretary*

Health Care Financing Administration
Louis B. Hayes, *Acting Administrator*

Bureau of Data Management and Strategy
Regina McPhillips, Dr. P.H., *Director*
David J. Butler, *Deputy Director*

Office of Statistics and Data Management
Michael R. McMullan, *Director*

Division of Information Analysis
Charles R. Fisher, *Director*

Office of Research and Demonstrations
George J. Schieber, Ph.D., *Acting Director*
Al Esposito, *Deputy Director*

Office of Research
Stephen F. Jencks, M.D., *Acting Director*

Division of Beneficiary Studies
Marian Gornick, *Director*

**U.S. Department of
Health and Human Services**
Health Care Financing Administration
1A9 Oak Meadows Building
6325 Security Boulevard
Baltimore, Maryland 21207

Official Business
Penalty for Private Use, \$300



U.S. Department of Health and Human Services
Health Care Financing Administration
Bureau of Data Management and Strategy
HCFA Pub. No. 03288 September 1989